The Living Countryside

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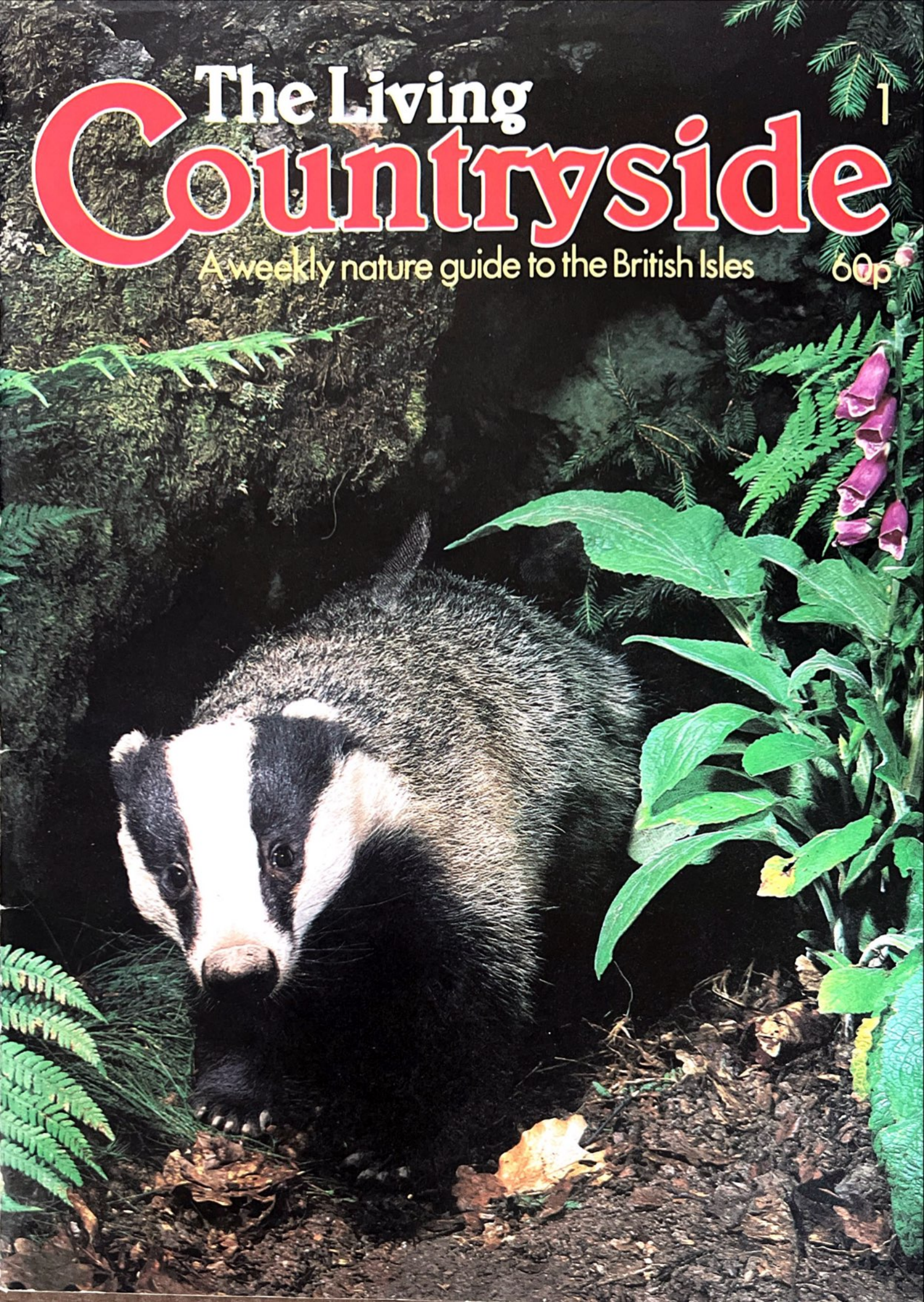
A weekly nature guide to the British Isles

60p



The Living Countryside

A weekly nature guide to the British Isles

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Issue one With spring just around the corner, *The Living Countryside* looks at how some plants and animals have coped with winter and how others are getting ready for warmer weather. February is the time when badgers usually give birth to their cubs, so our first article on badgers describes how they prepare their underground home, the sett, for this event. You can read more about their family life later in the year when the author will deal with other aspects of badger behaviour and biology.

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The British countryside is, without doubt, our most precious natural heritage. Even today, with new towns and motorways spreading across the land, about 90 per cent of the British Isles is still made up of green fields and woods, mountains and moorlands, and is fringed with thousands of miles of unspoilt coastline. This heritage we must do our best to preserve at all costs.

And it is a heritage that repays our care, giving us back so much pleasure. What joy it is to spend a day or two in the open air observing how nature changes with the seasons, inhaling the fresh green smell of woodlands. No one in the British Isles lives more than 100 miles from the seashore, or more than 200 miles from real mountains: we are more fortunate than most other nations in the variety of countryside within a day's journey from our homes.

Each habitat has its own communities of wildlife. Lying off the north coast of Europe, we are warmed by the Gulf Stream and blessed with a profusion of early spring flowers, as well as the lingering glories of autumn; and at all seasons we are visited by birds and insects migrating or carried by the wind. The sight of the tree by the bus stop in new leaf, a squirrel in the park, a great tit at the bird table—all this and so much else give us pleasure throughout the year.

Each of these experiences mean even more when you have a knowledge of the animals, the birds and the plants in their habitats. I am pleased to welcome this publication which promises to be an outstanding introduction to the fascination of the British countryside.

The Living Countryside

The shaping of the landscape

The living countryside of the British Isles has evolved over millions of years, but the greatest single influence on the land has been man. It's this close relationship between man and nature that gives our landscape its particular quality.

Compared with many parts of the world, Britain's landscape seems undramatic at first—there are no deserts, no jungles, no savannahs. But anyone who takes the trouble will discover that our beautiful countryside is infinitely rich and varied. As you read about the multitude of plants and animals in the following pages you will come across references to the great forces that formed our landscape—the geological upheavals, the Great Ice Age, wind and weather, and of course man himself.

Man's influence If man and his grazing animals had never come to Britain, the land would still be covered in primeval forest with the occasional glint of lakes and rivers, and bald mountain tops jutting through upland conifers. But very early on men started to make clearings in the forest, chopping down trees, burning the undergrowth, planting crops. (Many moors and heaths, such as Dartmoor, are the result of clearances which started in the Bronze Age around 3000 years ago.) Sometime after 500BC man introduced domestic sheep and cattle, their tearing teeth and horny hooves preventing the regrowth of the natural forest. As the centuries passed man ploughed, drained bogs and marshes, planted hedges, built cities and towns—and over 5000 years re-arranged the landscape so entirely that only a few remnants of the really wild 'natural' Britain remain. In its place we have a remarkably beautiful country in which man and nature maintain a complex relationship.

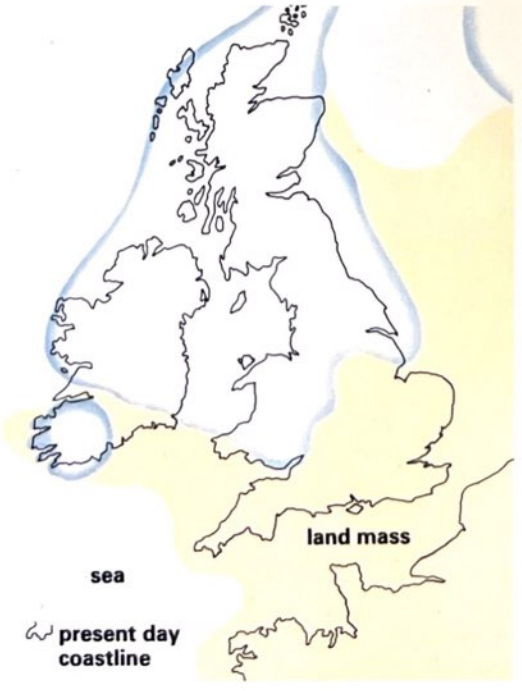
Britain joined to Europe As recently as 7000 years ago, Britain and Ireland were still joined to the European mainland. As the last Ice Age retreated north 10,000 years ago, so plants, animals and men moved in from Europe. But as the ice melted, the sea level rose. First it cut off Ireland, which is why Irish plant and animal life is less varied than in Great Britain and why, for example, there are no moles there (they had not by then succeeded in spreading that far west. Then the

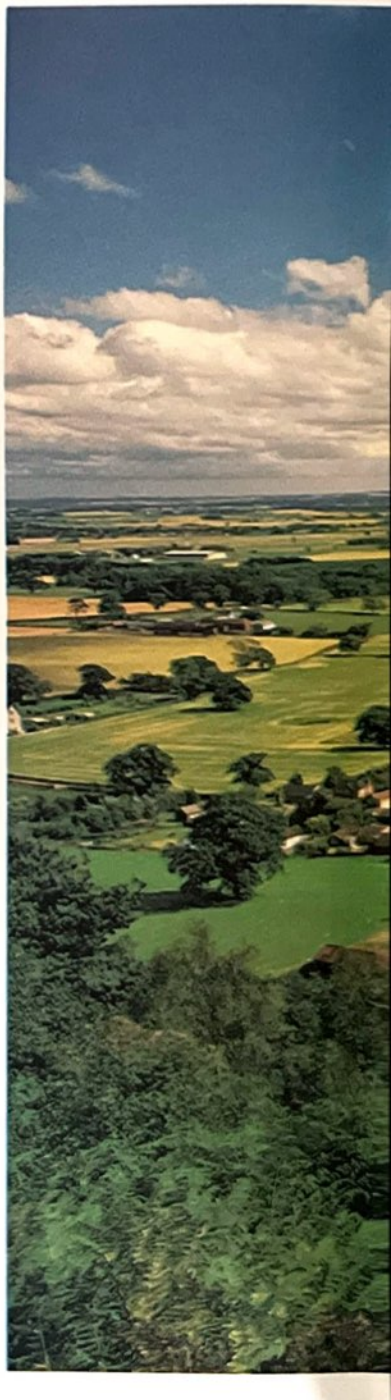
1st ice age	2000
warm period	700
2nd ice age	430
warm period	375
3rd ice age	175
warm period	125
last ice age	70
warm period	10
	7
	0

(table in thousands of years)
Britain becomes an island
present day

The Great Ice Age is the name given to the several glacial periods—or ice ages—which have occurred in the last two million years. During each ice age, glaciers swept down from the north, gouging, scraping and flattening the rocks that form the backbone of our country. In the intervening warm periods animals and plants moved up again from the south—even hippos and hyenas. As ice returned, the wildlife 'slate' was wiped clean.

The extent of the last ice age





Left: The Stiperstones in Shropshire are ancient outcrops of hard quartzite, more resistant to weathering than the softer rocks which surround them.

Below: Many flat farmland areas in Britain were once covered by seas. Others, like Grinshill in Shropshire, were flattened by glaciers and then covered in sand and gravel as the ice melted.

swampy areas of what is now the English Channel and the North Sea flooded, turning Britain into an island. Those species here before we became an island make up our native flora and fauna. These include most of our wild flowers, about three dozen trees and a wide range of animals. Thereafter, the only species that invaded from abroad were ones that could fly, drift across or were brought in by man, either on purpose (like pheasants) or unwittingly (like black rats).

Geological upheavals The geological foundations of Britain were laid down millions of years ago, then later modified and distorted by upheavals in the earth's crust, leaving a huge variety of different rocks, including granite, limestone, chalk and sandstone. We can still see these rock formations, from the ancient mountain of Suilven in Sutherland (1000 million years old) to the limestone pavements of Northern Ireland and Yorkshire, or the rolling chalk Downs in the south of England. Different rocks produced different types of soil; and since what grows on top depends on what is underneath, the flora often gives us clues to the underlying structure of our landscape. *The Living Countryside* will show you how to recognise the rocks and soil of Britain, and how they influence the habitats associated with them.

Returning to the present Long-term geological processes continue subtly to reshape the landscape, while man brings about more rapid, and sometimes devastating, changes. Modern intensive farming means that thousands of miles of hedgerows have been grubbed out and age-old meadows, with their rare flowers and associate butterflies, have been ploughed up. On the positive side, more areas are being set up as nature reserves and national parks to protect them from harmful change in the future.

Seasons and cycles in nature

The Living Countryside shows you what to expect in the weeks to come, following Britain's seasons through their cycles of birth and renewal.

The changing seasons, the inevitable rhythm of night and day, the intricate webs of survival and interdependence—each has a profound effect on the wildlife of Britain.

The seasons Most plants and animals are sensitive to changes of daylight and temperature. These two key factors regulate their life cycles and habits, preparing them for the abundance of summer and rigours of winter. Longer hours of daylight and warmth in spring encourage many flowers to open when insects are around to pollinate them. These same triggers make insect eggs hatch and prompt birds and mammals to moult at appropriate times of year, ensuring that a thick coat is present before the arrival of winter and shed again before summer comes. Shorter days and colder weather signal to swallows, for example, that it is time to migrate. Hibernators are forewarned of winter and begin to accumulate food stores or fat.

A delicate balance The countryside depends for its survival on a delicately balanced pattern of life and death. Natural disasters such as the drought of 1976 can affect this precarious cycle drastically (many trees died as a result). When man interferes, he threatens this balance too.

As you look at the simplified food chain illustrated on the right, imagine how even more widespread use of pesticides would affect those birds which feed on insects; how diseases such as myxomatosis (introduced by man) affect not only rabbits but also the animals that depend on them for food.

The Living Countryside aims to keep abreast of these changes, explaining and anticipating the natural events around us. But bear in mind that Great Britain is over 700 miles long, so the precise timing of seasonal events varies from one area to another. Years vary too; in warmer years spring may come early, for example. This all helps to add interest and excitement to the natural history of Britain, making this one of the most fascinatingly varied parts of the world to live in. It also means that exact dates cannot be attached to the seasons, so where months are given in *The Living Countryside* they are only approximations.

Winter Broadleaved trees lose leaves before winter. Otherwise water would be lost through the leaves at times when the soil may be frozen and fresh supplies of water cannot be taken up by the roots. Frost and rain help to break down the leaf litter, returning nutrients such as nitrates to the soil.

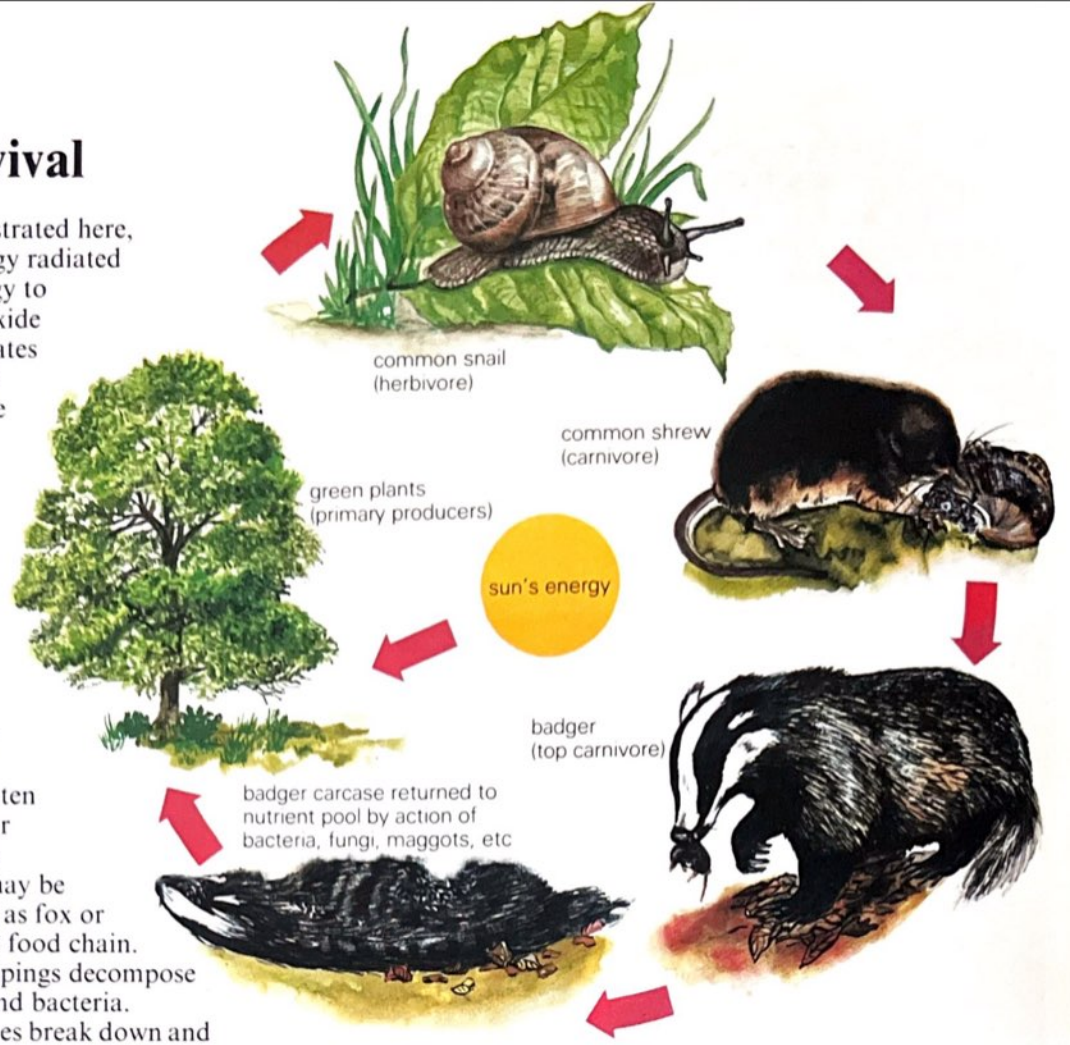
Spring Many woodland plants, such as bluebells and primroses, flower early before the tree canopy blankets them in shade. Hours of daylight are longer in spring (eight hours in mid-December, 13½ hours by mid-April) and this photo-periodic (light-time) switch triggers plants into flowering and trees into unfurling their leaves.

Summer The warmth of summer ensures that plenty of insects are available for birds, such as this skylark, to feed to their young. Long summer days (17 hours in mid-June) provide more time for birds to forage supplies for the extra mouths. But an early dry spell can mean a disastrous drop in numbers of insects—and so fewer chick survivors.

Autumn Small mammals, like this bank vole, are most numerous in early autumn. But once the glut of berries, nuts and seeds is over there is too little food for all to survive, and within a few weeks the population may be halved. Only the fittest survive the rigours of winter.

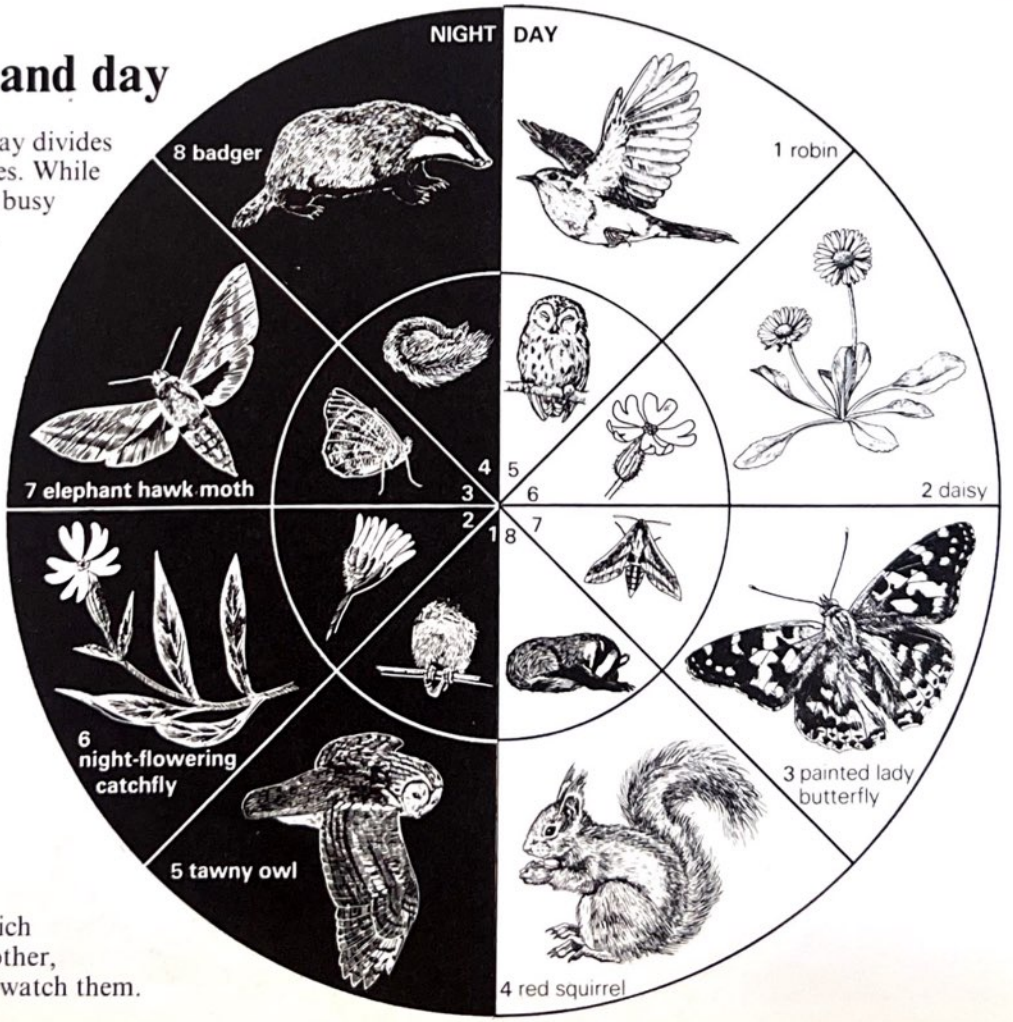
The cycle of survival

In the simplified food cycle illustrated here, everything depends on the energy radiated by the sun. Plants use this energy to combine water with carbon dioxide from the air to form carbohydrates such as sugar and starch. These combine with nutrients from the soil to make plant tissues. Along come herbivores (plant eaters) such as snails, rabbits or cows. Their digestive systems transform the carbohydrates, using them for growth and fuel in the creature's body. Activity burns up the fuel, releasing carbon dioxide back into the air through exhaled breath. The herbivore may die and return directly to the soil, or may be eaten by an insectivore (insect eater) or by a carnivore (flesh eater). This animal in turn either dies or it may be eaten by another carnivore such as fox or badger which is at the top of the food chain. Eventually all carcases and droppings decompose with the aid of maggots, fungi and bacteria. Trees and plants die and rot, leaves break down and all these nutrients feed a new generation of plants.



The cycle of night and day

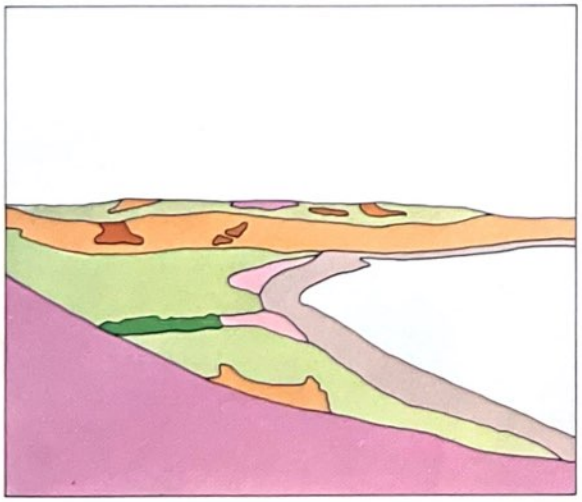
The 24-hour rhythm of night and day divides nature into two distinct communities. While one set of interdependent groups is busy during the day and resting at night, others become active only during the hours of dusk or darkness. In each case, the level of light acts as the trigger. Under cover of darkness mice and shrews can move around unseen, whereas during the day they would easily be spotted by predators. The eyes of many nocturnal animals such as the tawny owl are adapted to pick up as much light as possible, while the day-flying kestrels have exceptional focusing powers for long-distance hunting. Coloured flowers attract butterflies by day, while in a nocturnal partnership, moths pollinate the night-flowering catchfly, which attracts them with its perfume. *The Living Countryside* maps out which plants and animals depend on each other, and shows you when—and how—to watch them.



A PATCHWORK OF HABITATS

The British Isles are made up of a rich variety of habitats—from craggy mountains to lush pasture land, from heaths and bogs to oak woods and river banks. Discover how each one has its own particular group of plant and animal inhabitants.

Habitats are recognisable environments where distinct groups of plants and animals live and feed. Each habitat is usually associated with a particular set of soil and water conditions. For example, in a coastal sand dune habitat you should find marram grass, sea holly and sea spurge plants, together with typical nesting birds such as terns and ringed plovers. But you wouldn't expect to see bluebells and oak trees on these mounds of salty, calcium-rich shifting sand: they are just too dry, salty and wind-blown for most plants to live on. Similarly woodpeckers and roe deer are unlikely to be found in sand dunes because they need the trees of woodland habitats to survive.



No less than eight different habitats can be seen in this view of Porlock Bay, Somerset.

- **shingle shore**
- **saltmarsh**
- **moorland**
- **deciduous wood**
- **coniferous wood**
- trees marking position of **stream**
- **grassland** (including **hedgerow**)

Very often when you go for a walk you can spot a number of different habitats within close range, one merging into the other. In the view above, patches of coniferous plantation are dotted among large areas of deciduous woodland on the far hill. Strips of hedgerow, harbouring hundreds of insects, birds and mammals, divide up the farmland. A large ridge of unstable shingle sweeps round the bay. At the mouth of a stream is a patch of saltmarsh where a group of specialized plants and animals withstand the salty conditions. On the windy hilltops in the foreground, the moorland is dominated by heather, gorse and bracken all of which thrive in this type of habitat.

Life in a habitat

Each habitat has its own distinctive features. Oakwoods, for example, can grow on both sandy and clay soils and can survive very cold winters and plenty of rain. The trees offer cool shade for wildlife in summer and protection from frost in winter, so temperatures are less extreme inside the wood than in the open fields nearby. The plants and shrubs of the undergrowth have to be shade-loving or early flowering.

Nearly 300 insect species are known to live and feed on oak roots, bark and leaves. By contrast only a handful of insects can cope with the hard needles of pine trees. The teeming insect life of the oak attracts many birds; some, such as the tree creeper, hardly ever leave the wood.

Above: Purple hairstreak butterflies live only in oakwoods, feeding on the honey dew left by aphids. Below: A badger may live in a woodland habitat, but will often venture out of the wood to feed in grassland nearby.

Acorns provide a plentiful food source for birds and small mammals. Squirrels, for example, bury them as a hoard for winter. Carnivores, such as stoats and foxes depend on these small mammals for food.

Mini-habitats—such as a rotting stump which houses an exclusive community of fungi, mosses and small animals—often exist within larger ones.

The cycle of life continues in an oakwood as long as new trees grow up to replace the old, but when woods are heavily grazed by deer or cattle the saplings are destroyed. The young oaks must be protected if the wood is to survive.

A habitat may contain other habitats such as a small pond. The range of life in this depends on the amount of shade cast by trees.

Where man meets nature

Over three quarters of the land in the British Isles is devoted to agriculture. Here areas such as hedgerows, cornfields and meadows with grazing animals, each constitute a form of habitat. As with natural habitats, the combination of climate and soil produces a definite pattern for man-made farmland. Some areas are mainly concerned with arable farming (cereal and fodder crops), some with horticulture (fruit and vegetables), while others—usually the wetter places—are devoted to livestock rearing (sheep, beef and dairy cattle). During the weeks to come, *The Living Countryside* will explore what goes on in today's farming landscape.

Although farmland is a man-made habitat, it is still often the home of a rich assortment of wild plants and animals. As you look more closely, for example, you can recognise pasture meadows in spring and summer by the wide variety of wild flowers growing in them; planted grass fields have fewer species. Even in areas of intensive arable farming, wildlife still survives in the patches of semi-natural vegetation between crop fields and in odd corners into which bulky farm machinery cannot reach. Some species, like the black headed gulls shown below, actually move in to take advantage of man's reshaping of the land. When fields are ploughed the birds gain access to a new source of food they could not have had without man's help.

However, farming also poses serious threats to wildlife. Natural habitats contain a multitude of varied plants and animal species, all doing their own thing for their own benefit. But with agricultural land all the sun's energy and the soil's nutrients, that are shared out among the species in a natural habitat, are directed to growing food.

Intruding plants are weeds, any herbivore that treats the crop as though it were its customary food plant is destroyed as a pest. Natural cycles are modified or disrupted. Ploughs assault the land, while grazing, fertilizers and chemicals all have dramatic effects too. Of course it has to be this way in order to feed our own species. Similarly, urbanisation and pollution—to a certain extent necessary evils in a densely populated industrial country like Britain—affect wildlife adversely. All the more reason for us all to understand what is going on in the environment and to watch out for the possible consequences.

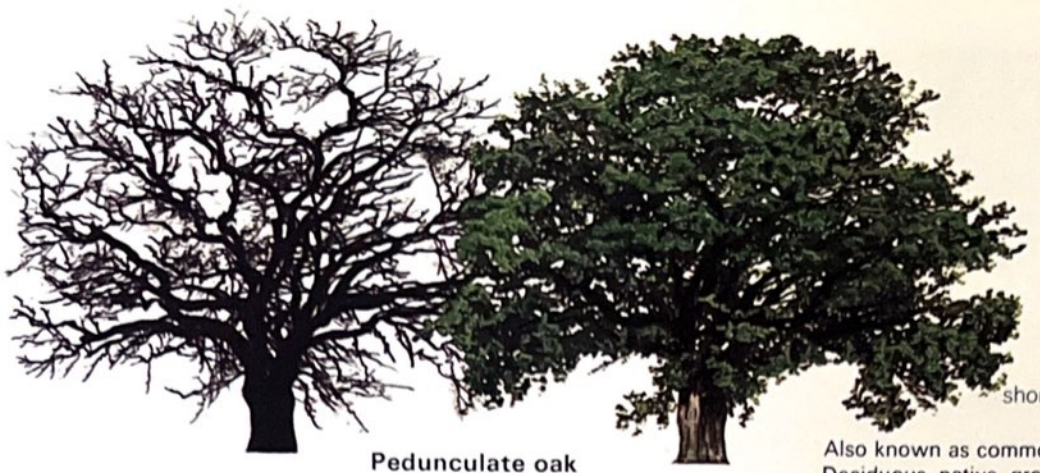
The Living Countryside will explain the complex—and at times strained—relationship between man and nature, not only in this habitat but in many others as well. With this publication you will be able to assess what needs to be conserved and how to set about it.

THE MIGHTY OAKS OF BRITAIN

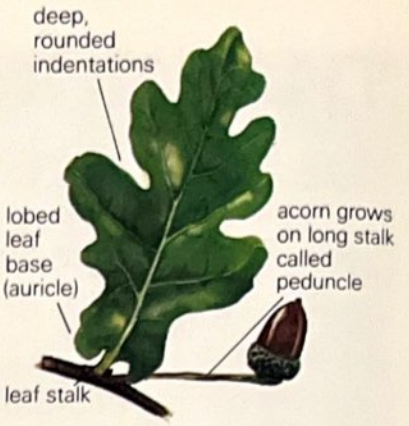
Oak trees live longer than all other native trees and support a greater variety of wildlife than any other species in our islands. Even when they die, they still give food and protection.

From the top of its spreading crown to the ends of its roots, which can extend as far below the ground as its branches reach into the sky, the oak tree provides shelter and food for hundreds of different organisms. Like a crowded highrise block, the oak is inhabited at every level: birds and squirrels build nests in the crown, insects such as wasps, moths, beetles and weevils devour the leaves; ivy, mistletoe, lichens, mosses, algae and fungi invade the branches and bark; birds, insects and mammals feed on the acorns. Even the roots of the young oak are sought out by such insects as weevils and, as the oak lets in quite a lot of light through its leaves, flowering plants grow underneath it.

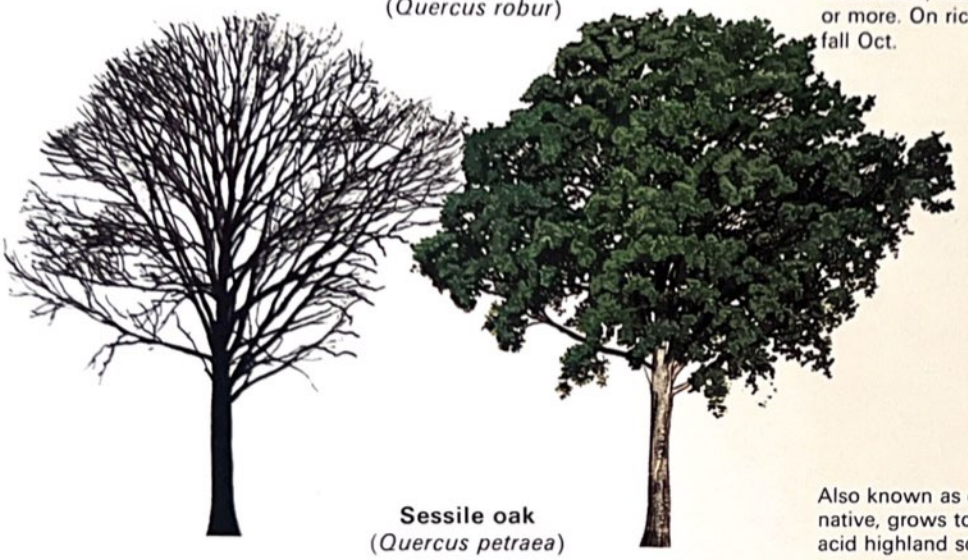
Below: Oak trees make up one tenth of all English woods. A fine specimen like this pedunculate oak may take up to 100 years to mature.



Pedunculate oak
(*Quercus robur*)



Also known as common or English oak (*Quercus robur*). Deciduous, native, grows to 30m (100ft), may live 800 years or more. On rich lowland soils in Britain. Flowers May, acorns fall Oct.



Sessile oak
(*Quercus petraea*)

Also known as durmast oak (*Quercus petraea*). Deciduous, native, grows to 30m (100ft), lives up to 800 years. Mainly on acid highland soils in Britain. Flowers May, acorns fall Oct.

You may think that the oak must be quickly overpowered by this invasion of wildlife, but once a sapling becomes established the oak can live for up to 800 years, continuing to act as host to this multitude of creatures. In fact the oak has adapted itself so successfully in temperate regions that there are over 450 different species of oak in the world. Several of these oaks grow in Britain and Ireland, but only two, the pedunculate (also known as the common or English oak) and the sessile (durmast) oak are native to our islands. It is not always easy to tell the difference between them.

When it is growing in the open, the pedunculate oak is gnarled and tends to have lower, more horizontal and wider-spreading branches, so that the main trunk is hidden beneath a mass of boughs and leaves. The sessile oak has a straighter, less gnarled trunk, with branches growing from higher up.

You are likely to come across woods where both species of oak are growing, often among other trees. The huge forests of Epping and the New Forest are typical of such mixed woods. Here it is more difficult to distinguish the two species. For example, when the pedunculate oak competes for light with other trees it may lose some of its broad shape. To make it even more confusing, one species is frequently fertilized by the other and the result is a hybrid with characteristics of both species.

Close up If you get close to a true sessile or

Native or introduced?

Among the scores of different trees seen in Britain today only 35, including the sessile and pedunculate oaks, are native species (right), ie they spread into this country naturally, without the assistance of man. This was possible at the end of the last Ice Age—about 10,000 years ago—because at that time Britain still formed part of the European land mass.

To begin with only the hardiest plants, such as mosses and bilberry bushes could survive. But as the climate grew warmer trees like hazel, Scots pine, birch, elm and later oak established themselves.

Then about 7000 years ago Britain was separated from the rest of Europe. Melting glaciers caused the sea level to rise, flooding what is now the North Sea and English Channel. This watery barrier prevented further natural invasion by non-waterborne plants such as trees. So the trees that had managed to reach Britain by that time are our 35 native species.

The majority of different types now in Britain were introduced by man because they were useful or ornamental. When the Roman legionnaires settled here they brought the edible sweet chestnut. Remains of walnut trees have also been found in Roman villas. The Norway spruce, the familiar Christmas tree, arrived in the 16th century and the handsome cedar of Lebanon and the horse chestnut in the 17th century.

COMMON NATIVE TREES

Aspen (*Populus tremula*)
Bay willow (*Salix pentandra*)
Bird cherry (*Prunus padus*)
Black poplar (*Populus nigra*)
Box (*Buxux sempervirens*)
Common alder (*Alnus glutinosa*)
Common ash (*Fraxinus excelsior*)
Common beech (*Fagus sylvatica*)
Common pear (*Pyrus communis*)
Common yew (*Taxus baccata*)
Crab apple (*Malus sylvestris*)
Crack willow (*Salix fragilis*)
Downy birch (*Betula pubescens*)
Field maple (*Acer campestre*)
Goat willow (*Salix caprea*)
Grey poplar (*Populus canescens*)
Grey willow (*Salix cinerea*)
Hawthorn (*Crataegus monogyna*)
Hazel (*Corylus avellana*)
Holly (*Ilex aquifolium*)
Hornbeam (*Carpinus betulus*)
Juniper (*Juniperus communis*)
Midland hawthorn (*Crataegus laevigata*)
Pedunculate oak (*Quercus robur*)
Rowan (*Sorbus aucuparia*)
Scots pine (*Pinus sylvestris*)
Sessile oak (*Quercus petraea*)
Silver birch (*Betula pendula*)
Small-leaved lime (*Tilia cordata*)
Strawberry tree (*Arbutus unedo*)
Whitebeam (*Sorbus aria*)
White willow (*Salix alba*)
Wild cherry (*Prunus avium*)
Wild service tree (*Sorbus torminalis*)
Wych elm (*Ulmus glabra*)

pedunculate oak, however, you should be able to tell them apart quite easily.

The leaves of the pedunculate oak are pale green and virtually hairless, with two obvious 'ear-lobes' (auricles) at the base. They have deep, rounded indentations all round. In autumn, acorns grow on long stalks called peduncles—hence its name.

The leaves of the sessile oak are dark green, have no auricles and the indentations are not so deep. Leaves grow on long stalks and have a few hairs on the midrib of the underside. Unlike the pedunculate, the sessile acorns sit on the twig.

Pedunculate oak woodlands are the most common, and are usually found on heavy clay soils throughout lowland Britain. The pedunculate oaks at Bagshot Sands in Berkshire and Hovingham, North Yorkshire, are well worth a visit. Sessile woodlands are found in the highland areas of Britain and usually occur on shallow acid soils. The Birkrigg and Keskadale oaks south west of Keswick in the Lake District are excellent examples of 'pure' sessile woodlands.

Acorn bonanza Trees are flowering plants but many of their flowers are not spectacular, large or colourful and the oaks are no exception. Inconspicuous female catkins (flowers) are pollinated by the wind-carried pollen grains from male catkins (so large petals needed to attract insects for pollination are unnecessary). The oak's acorn crop varies from year to year—in a bumper year each tree can produce as many as 50,000 acorns. But few of the hundreds of thousands that fall every year grow into full-sized trees. Acorns start to form in early summer (the warmer the summer the larger the acorns), and then during a few weeks of early autumn they fall to form a dense carpet. They do not stay long on the ground for they are seized by hordes of birds and animals, either to be eaten or stored away for the winter. Jays and squirrels in particular bury them (sometimes quite a distance from the wood) and then forget about them. This is one of the ways the oak is spread across the countryside.

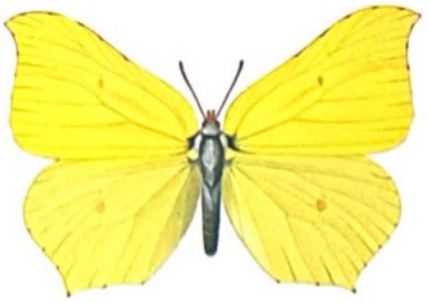
Valuable tree Oak woods covered much of Britain in medieval times and our ancestors quickly discovered that oak made good fuel. The sessile oak was also valued for its acorns. From the Middle Ages until the 18th century people drove their pigs into the oak woods on common land to feed on the abundant acorns. Indeed, one way of assessing and comparing the size of each manor's forest was to count the number of grazing pigs that could be supported. Such grazing rights still exist today in the New Forest in Hampshire.

Oak wood was used extensively for shipbuilding and many parks, such as Regents Park and Greenwich Park in London, were planted especially to supply the Royal and Merchant navies. Oak wood was used extensively for supporting beams in country cottages and is still used by builders today.

Above: Woods often contain both pedunculate and sessile oak trees, in which case it is often difficult to distinguish between the trees by shape alone. Closer inspection is necessary for identification.

Left: In May you can see these tassels of male catkins dangling on the twigs. Female flowers are hidden at the end of the new leaf shoots.

Left: Acorns fall in autumn and germinate if kept moist, not producing leaves until the spring. Seedlings grow 15cm (6in) in six months.



The brimstone (*Gonepteryx rhamni*) is the butter-yellow herald of spring and its colour is thought to have given us the word 'butter' fly. Its wingspan is 5cm (2in); the food plant is buckthorn. Its life cycle is: eggs May-July; caterpillar June-early August; chrysalis July-August; adult July onwards.

SLEEPING BEAUTIES

The cold weather of winter poses a major problem to many creatures and butterflies are no exception. Depending on the species, they hibernate, migrate or die. The peacock, small tortoiseshell and brimstone butterflies are three which opt for hibernation.

The beautiful peacock and small tortoiseshell butterflies that feed on Michelmas daisies in autumn gardens are the same butterflies that will be out and about searching for flowers on the first sunny, warm day of the new year. The peacock and small tortoiseshell are usually up and about in March, while the brimstone, which favours the flowers of the woodland rides, can often be seen much earlier particularly in the south of England—even in January if the weather is suitable.

These butterflies live for about nine months in their adult stage, much of this time spent in hibernating sleep. Other butterflies have different methods of coping with winter: a few migrate to warmer climates where nectar is available, while others survive the winter in the inactive egg or chrysalis stage or hibernate in the caterpillar stage.

Butterflies need the sweet energy-rich nectar from flowers to give them strength to fly and help them survive their hibernation through the long winter months. During this inactive state their energy consumption is minimal, so they can survive without further food. As a protection against the cold, some sugar in their blood is converted to glycerol which works rather like anti-freeze in car radiators.

Hibernating time In late autumn the peacocks, small tortoiseshells and brimstones search for a safe, dry, dark place where they will be protected from winter frosts. Usually peacocks find a hollow tree, although they will sometimes tuck themselves in a wood pile or a corner of a garden shed. Small tortoiseshells choose similar places, but are also quite likely to come indoors. A hideaway behind a picture in a little-used room is safer than a hollow tree: there are no birds to eat them while they sleep. Brimstones seek dense, evergreen cover in their woodland surroundings —and particularly thick growths of ivy or holly which offer protection.

The butterflies often bury themselves among dead leaves. At rest, the bright wing colours are hidden; only the underside, looking like a dried-up leaf, is visible. This gives

The small tortoiseshell (*Aglais urticae*) after the nectar in an ice plant (above). This butterfly is widespread and common in gardens and other habitats, although less so in northern areas and in Ireland. Its wingspan is 5 cm (2in); the food plant is the stinging nettle. The autumn brood may hibernate in, for example, a shed roof (right). The underside of its wings gives the appearance of dead leaves, wood or bark.

The peacock (*Inachis io*) is very widespread and common in England and Wales, less so in Scotland and Ireland. It is very much a garden butterfly, but you will also find it in open fields, on downland and in woodland. It has a wingspan of 6cm (2½in); the caterpillar's sole food plant is the stinging nettle. When resting the peacock folds its wings, the undersides of which resemble dried leaves and give it excellent camouflage. The female lays her eggs on the underside of the nettle leaf near the growing shoot.

All peacock caterpillars of the same brood turn into chrysalids within a few days of each other.

the butterflies particularly good camouflage.

The peacock has a spectacular defence mechanism which it uses if it is disturbed from rest. Opening its wings, it creates an alarming hissing noise as the front and hind wings rub across each other, revealing huge 'eye-spots'. A small bird, startled by the hiss and then confronted by large owl-like eyes, will usually fly off, leaving the butterfly to go back to sleep.

With the first spring sunshine in late March the peacocks and tortoiseshells awake from hibernation; individual peacocks can be seen much earlier in fine weather, when they come out for a short flight. Although the brimstones may be tempted to stir as early as January, they return to hibernate until later. Sometimes tortoiseshells hibernating indoors also wake too early, perhaps because the heating is switched on in a spare bedroom. If you see a tortoiseshell fluttering at a window in midwinter, put it in a cool shed or garage where it can go back to sleep until spring really arrives. There are small migrations of tortoiseshells from abroad which augment our own butterflies.

The new brood of adult brimstones emerges in July and August and spends most of the day feeding. It shows a distinct preference for purple flowers, particularly those of the thistle, knapweed, scabious, bramble and clover. The new brood of adult tortoiseshells, which emerges in late June or July, lays eggs to produce a second brood in August and September; this feeds on most garden flowers, especially ice plant and buddleia, and is the overwintering brood. The peacocks emerge later—in August—and are numerous in gardens where they feed on buddleia and in fields where they feed on lucerne, thistle, knapweed, marjoram and clover.

Remember that you need more than flowers to attract butterflies to your garden. An undisturbed corner of a shed will give the butterflies somewhere safe to hibernate and a patch of nettles in a sunny corner of the garden will feed the caterpillars which will turn into chrysalids and eventually become the next generation of butterflies.

The brimstone caterpillar eats the leaves of the food plant—buckthorn.

The small tortoiseshell caterpillar feeds on the same plant as the peacock.

Life cycle of peacocks and small tortoiseshells

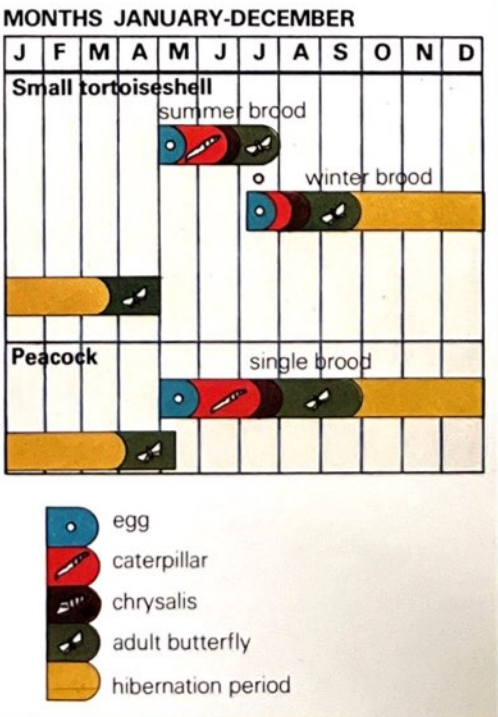
Butterflies go through four stages: the egg, the rapidly feeding and growing caterpillar, the chrysalis and the adult butterfly. A peacock takes one year to complete a cycle but the small tortoiseshell caterpillar has less growing to do and there is time for two broods each year. The summer brood lives only a few weeks as butterflies.

Egg After feeding for a few days from spring flowers, peacocks and tortoiseshells mate and then the females search for stinging nettles on which to lay eggs.

Caterpillar When the eggs hatch, the crowd of young caterpillars spin a single silk tent in which they all live as they feed and grow.

Chrysalis The fully grown caterpillars crawl away to find a fence or branch from which they can hang down while they turn into chrysalids.

Butterfly Within a few weeks the glistening adult emerges fully grown. The butterflies die several weeks after mating and laying their eggs.



BADGERS—EXCAVATORS OF THE WOODLANDS

Badgers spend most of the day out of sight—underneath a sloping hillside covered with plenty of undergrowth. Inside this hidden lair they either rest or are busy digging to improve and enlarge their chambers and passages. At dusk they are up and about playing, hunting for earthworms, insects and even rabbits, airing old bedding or collecting new bedding for the sett.

Badgers have been described as the oldest land-owners in Britain. There is little doubt that long before Britain was an island they were here rooting among the vegetation of ancient deciduous forests. They belong to the family of mammals that have musk-bearing scent glands under their tails: these are chiefly carnivorous and including the otter, polecat, stoat, weasel and pine marten.

Many millions of years ago the earliest forms of this family group were rather simple land-dwellers, but they have gradually become adapted to their different ways of life and habitats. Thus the otter has become an accomplished swimmer and the pine marten a trapeze artist; the polecat, stoat and weasel are streamlined for speed and the badger has become a skilful excavator.

You can tell from its appearance that the badger is a digger. Its body is wedge-shaped and carried rather low on the ground on short but immensely strong legs—excellent for working in confined spaces. The muscles of the forelimbs and neck are particularly well developed and the five claws on each foot are long, especially those on the front ones.

The badger's digging activity is geared to enlarging and improving its home: a large underground burrow system called a sett, which consists of several sizeable chambers where the badger sleeps and breeds and a few smaller ones which sometimes serve as latrines. These chambers are linked by a complex network of tunnels.

When enlarging one of its tunnels a badger will loosen the earth with rapid strokes of its forelimbs, using its claws as rakes and for winkling out stones. The loose earth collects under its body, but by arching its back it is able to bring its hind limbs forewards to sweep the earth backwards. When enough soil has collected behind it, it moves backwards in a series of jerks, partly using its bottom as a bulldozer and partly hugging the soil between its forelegs and body. If you stand by an exit hole when a badger is digging you may be showered with earth and stones as it emerges backwards and gives a few last vigorous kicks before returning for another load.

As well as a home improver, the badger is also a tidy housekeeper and will spend a lot of time transporting grass, straw, moss or bracken to and from its sleeping chamber. Setts are handed down like family houses, from generation to generation, and the badger uses the same sett year after year. So regular airing of the bedding is vital as a safeguard against parasites (the scourge of all animals living a settled existence) and to prevent damp, cold conditions—especially harmful to young cubs.

Locating the sett A mild day in early spring is a good time to start looking for a badger community, although it is very unlikely that you will see a badger itself in broad daylight. Woods, copses and hedgerows are the most usual locations for setts, especially if these are on slopes bordering pastures. Here the badger can make its home where there is adequate cover and plenty of food in the vicinity.

Alders are often associated with badger setts, so look for patches of these trees. Elders will also grow near setts because badgers eat the berries and pass the seeds unharmed through their guts before depositing them in the droppings near their sett. Here the seeds will germinate and eventually become bushes or trees.

A well-established sett is unmistakeable. It will normally have anything from three to 10 entrances and a few have been found with more than 50. These entrances and exits are at least 25cm (10in) wide, much larger than rabbit holes. Outside each entrance is a large pile of earth which includes dried plant material such as hay or straw. This is old bedding which has been discarded. You will usually see a latrine close to an entrance, too. Near a main entrance you may see a tree, often an elder, with mud marks and scratches on it up to a height of about one metre. If you watch at dusk you may see a badger approach such a tree, raise itself on its hind legs, reach up with its forepaws and slowly drag these down the bark. Zoologists still don't know if the badger is merely stretching its limbs or perhaps marking a territory with its own particular scent.

Well-worn paths lead from the sett in

Above: Badgers usually have a black and white face and a grey body, although their fur is often stained yellow or reddish by the local soil.

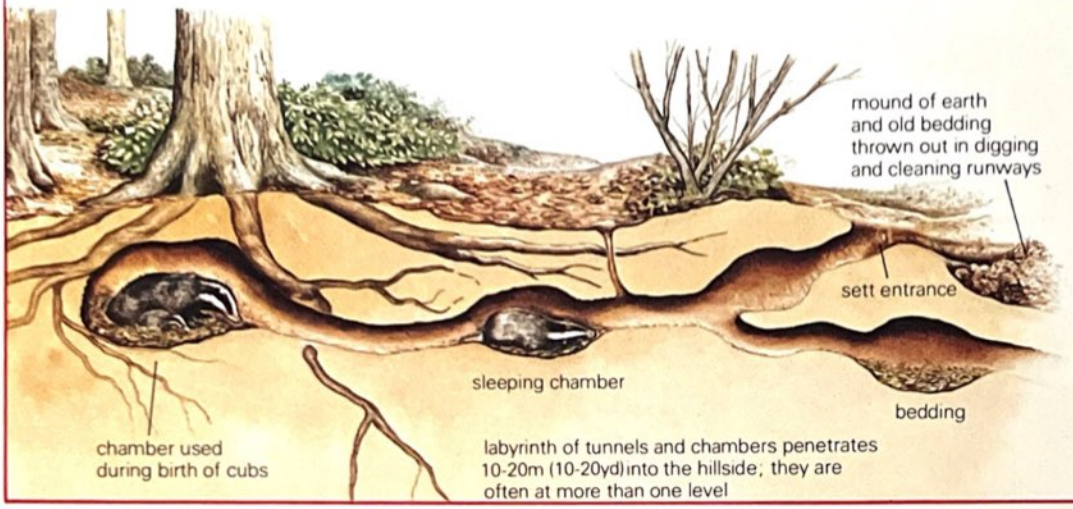
Left: A sow bringing back bedding straw. As many as 30 bundles may be collected on a dry night to furnish the underground chambers used for sleeping and breeding.

BADGER (*Meles meles*)
Also called brock
Size of adult heaviest in autumn, lightest in spring Male 11.6kg (25½lb). Female 10.1kg (23¾lb). Average length of male 90cm (3ft) including tail. Female slightly smaller
Colour grey, rarely pale reddish, albino or blackish
Breeding season young usually born mid-Jan to mid-March
Gestation period 7-8 weeks of 'true gestation' preceded by a variable period of delayed implantation (2-10 months)
Number of young 1-5, average about 3. During first 8 weeks may reduce to 2
Lifespan Average 2-3 years, max about 15 in the wild
Food diet very variable, but earthworms by far the most important. Also insects (esp. beetles), small mammals, carrion, cereals, fruit
Predators adults seldom killed by predator, cubs occasionally killed by dogs and foxes. Many killed by gamekeepers and farmers
Distribution widespread. More in wild, wet areas of south and west, fewer in flat, heavily farmed areas, and above 900m (1200ft)

The badger's sett

In most setts badgers use only one chamber for breeding. Here the cubs will stay bedded down in a mass of hay or bracken. The sow will suckle them there but may sleep in a nearby chamber. Others in the group will often cuddle up in another chamber.

Badgers will enlarge some of the tunnels every few metres to form passing places. Tunnels can go as deep as 4m (13ft), but most are less than 1m (3ft) underground and often follow the contours of the surface. This allows better circulation of air. Ventilation holes sometimes connect a tunnel with the outside, but whether by design or accident is not known.


mound of earth and old bedding thrown out in digging and cleaning runways
sett entrance
sleeping chamber
bedding
chamber used during birth of cubs
labyrinth of tunnels and chambers penetrates 10-20m (10-20yd) into the hillside; they are often at more than one level

Above: The entrance to a sett; if you see one, check around for others. The entrance looks rather like a fox hole, but badgers scratch the earth away to a large heap nearby, leaving a furrowed track from the hole.

A motorway underpass built for badgers

A tunnel purpose-built for badgers, to prevent them from being run over by busy traffic, was constructed in 1976 under the M5 motorway near Wellington, Somerset, where it intersected a badger path leading from the sett to feeding grounds.

Although specially designed to save badgers' lives and to prevent accidents, this safe, underground route did not seem to be able to lure the badgers—despite the use of bait to attract them, and such ingenious methods as a man with badger's scent on his coat crawling through the tunnel.

Only when the rearing of cubs made them seek larger food supplies did the badgers 'officially open' the site in 1979 and claim the territory with the placing of latrines at either end.

various directions, joining one entrance to another and also leading off to different parts of the badgers' territory. It is interesting to map this system of paths, which alters little from year to year. Although visible to us these paths are really scent trails, since all the badgers using them mark them periodically with their own scent. Unfortunately some of these paths, which have been used by badgers for generations, are now crossed by roads and many badgers are run over by passing traffic.

Signs of foraging Look out for signs near the sett where the badgers have been foraging. You may see dead leaves disturbed where badgers have been rooting or shallow pits dug when they have been seeking out some beetle or earthworm. The corms (underground stems) of lords-and-ladies are favourites at this time of year; badgers bite off the poisonous yellow shoots and eat the succulent underground corms.

But what goes on in the depths of a sett? A large, well-established sett in the Cotswolds which was given a thorough survey had 12 exit holes and a maze of tunnels and chambers totalling 310m (1000ft). From the length and diameter of the tunnels it was estimated that over the years the badgers had excavated 25 tonnes of soil.

Birth of the cubs If you notice a spurt of digging activity in late December or in January and, if the weather is dry, some fresh grass or bracken dropped near an entrance, you can be fairly certain that the birth of cubs is imminent and the breeding chamber is likely to be quite near that hole.

Bedding is also of great importance for the survival of the cubs as a chamber full of hay, straw and bracken will act as an insulator, helping the cubs conserve their body heat. For the first few weeks after birth they lie in this cosy nest and are suckled when the sow (female) returns from foraging trips.

The gathering of bedding is an interesting manoeuvre. The badger collects up bundles of dry vegetation, scraping the pieces together with its claws and biting off tough stalks with its teeth. Hugging each bundle in turn to its chest and using its chin and forelegs to keep it in place, it shuffles backwards towards the sett, eventually disappearing down the tunnel tail first.

Usually cubs are born during the first fortnight in February in the south and west, rather later as you go north. They are covered in grey silky hairs and already the dark facial stripes are visible. They are about 12cm (5in) long and weigh about 100g (3½oz). Their eyes are closed for about five weeks, but before long they are ready to explore the tunnels.

Mating period The first three months of the year are a busy and exciting time for the badger community. Soon after the birth of the cubs, most sows become ready to mate again and yearling females may come 'on heat' for the first time at this season. So mating can be

a conspicuous feature to watch out for at this time of year.

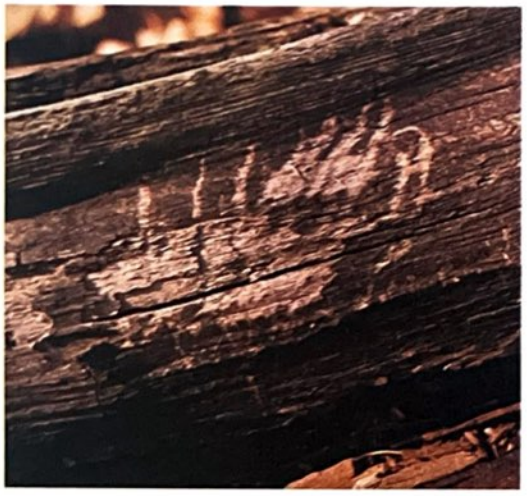
The dominant boar (male) usually occupies a part of the sett well away from where the sow has her cubs; and she will drive him off if he attempts to approach her litter. The boar's behaviour at this time is largely concerned with mating, territorial defence and feeding. On some evenings he will emerge early and visit the various sett entrances, sniffing and making a deep whinnying purr. If a sow emerges and is on heat he will mate with her. Mating can last half an hour and may be repeated over several nights.

At other times the boar may quickly leave the sett and follow one of the main tracks to the limit of territory owned by his social group. Here he will scent-mark the boundary with droppings, using latrines strategically placed to warn off intruders. He may also patrol the perimeter of the territory and if necessary fight with any trespassing badger.

Meanwhile the sow makes short foraging excursions nearer to home to find food for herself and to build herself up for suckling the cubs. On wet nights, earthworms will be the main source of food, but many other creatures will be taken including the occasional dead bird and any early litter of young rabbits she smells and digs out.

The cubs are weaned in summer and start to venture above ground to feed and play—so summer is a good time to watch badgers.

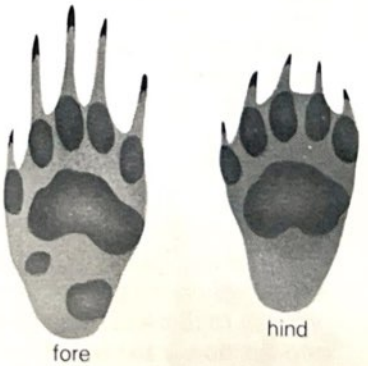
Above: Two well-grown cubs. The number in a litter varies from one to five, but two or three is most usual. Cubs are nearly always born in early February.



Watching badgers

Find the tell-tale signs of a badger sett, such as piles of discarded bedding straw and latrines, and you will soon discover badgers. To check if the sett is occupied, place a thorny bramble firmly inside the entrance and look next day to see if any black and white hairs are snagged on to the thorns. You may also notice hairs caught on barbed wire fences in the area (below left) badger footprints in the earth (below) or claw marks on nearby trees (left).

Watch for badgers from a well-concealed spot upwind from the sett or they will catch your scent; the best time is sunrise or at dusk. You may tempt them out with meat scraps or a bone near the hole. If badgers accept your offering, they may come back for more.



Above: On each foot the badger has five toes with strong claws. The claws on the forefeet are longer than those on the hind, which are often worn down by constant digging. Badgers tread heavily, but even so only four of the five toe pads may show up clearly in a track.

WINTER FLOWERS

The greys and browns of the winter landscape epitomise the bleakest time of the year in terms of nature. But a few flowering plants flourish despite the conditions and introduce a much needed splash of colour. Why do they come out now and how do they survive?

It is very unusual in the plant world for flowers to bloom only in the middle of winter. Out of about 2,000 species of flowering plants native to the British Isles, only a couple of dozen have a true flowering season in January and February.

Some plants will flower spasmodically all year round given favourable weather conditions—plants like shepherd's purse, chickweed and Persian speedwell—but their peak comes in the warmer months when they are growing most vigorously. To most people the true winter flowers are the snowdrop and the winter aconite: the first obvious flowers of the new year, they provide a very welcome sight.

Snowdrops begin to flower as early as Christmas in a mild winter, but if it is very cold they will wait until well into March. They were once rare in Britain, found only in the damp woods of western England, but today they are much more widespread, probably having escaped from gardens into surrounding woods. The flowers close at night and when they open the next morning, usually around ten o'clock, the petals start to ooze out nectar. If you touch the tip of your tongue inside a snowdrop after it has been open for a few hours it tastes slightly sweet. Because the petals droop the nectar is protected from rain. The flower is a powerful attraction to the few early insects about at this time of year. Honey bees are sometimes seen to land on one of the spreading sepals and, by clinging to this with their hind legs, they delve into the flower for pollen and nectar.

Spring snowflakes are rare relatives of the snowdrop and they too are more often found as a garden escape than as a true descendant of plants of our primeval forest. Similar to a large, robust snowdrop, the spring snowflake is easily recognised by its bell-shaped flowers with green tips to the petals. They come out a little later than snowdrops and are sometimes produced in pairs on the stem.

Winter aconites come into flower at about the same time as snowdrops, their flowers expanding in sunny weather to reveal curious tubular petals which again hold droplets of nectar. Each flower is surrounded by a leaf-like ruff, but the true leaves, which are highly poisonous, emerge from the ground only after the flowers have withered. Introduced from Southern Europe 400 years ago, the winter aconite has become widely naturalised.

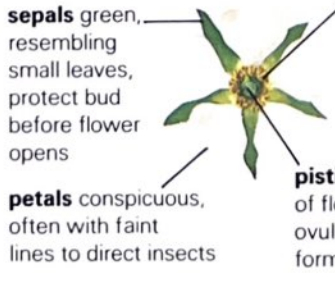
Above: The first yellow flower of the new year, the winter aconite opens its shiny sepals in the sun when the temperature reaches 10°C (50°F).

Barren strawberry By far the commonest of our winter flowers, if not the most spectacular, is the barren strawberry, so called because it superficially resembles the true strawberry, but its fruit is hard and inedible. It too produces nectar (from a small five-sided nectary, a pad between its stamens and ovaries) and this is drunk by flies and beetles and even the occasional small tortoiseshell butterfly that has woken early from its hibernating sleep.

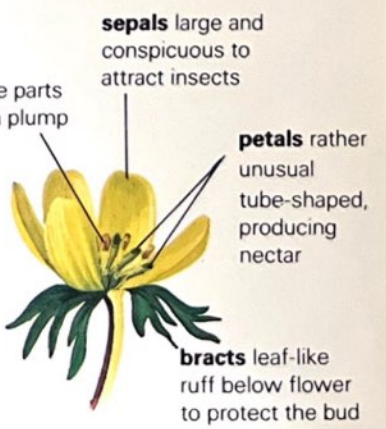
Winter survivors Most plants are dormant

Structure of flowers

The first job of any flower is to produce seeds, which it usually does by attracting insects for pollination. The barren strawberry has a simple flower structure and insects are drawn to the nectary within the flower. The winter aconite is one of many variations on this theme: its sepals, resembling petals, attract insects, and the petals have evolved into nectar cups.


sepals green, resembling small leaves, protect bud before flower opens
stamens male parts of flower with plump sac at tip containing pollen
petals conspicuous, often with faint lines to direct insects
pistils female parts of flower containing ovule which later forms seed

Barren strawberry


sepals large and conspicuous to attract insects
petals rather unusual tube-shaped, producing nectar
bracts leaf-like ruff below flower to protect the bud

Winter aconite

in mid-winter and wait until later to flower, when pollinating insects are abundant and the milder weather encourages growth. Although winter flowers have a monopoly of any insect such as bees or flies that may be about, this is scarcely sufficient reason to flower now.

So why do these particular plants expose their flowers to the rigours of winter? Partly it is because they do not depend entirely on insect pollination for reproduction and each plant can be fertilized by its own pollen. They also have root structures which can multiply and produce new plants. (Winter aconites have tubers, snowdrops and snowflakes have bulbs, and barren strawberries have runners.) However, plants only 'improve their stock' if one flower is fertilized by the pollen of another, and with both these 'do-it-yourself' methods of reproduction the new plant is usually identical to the parent. If cross-pollinated, the next generation turns out slightly different from the parents, and consequently some plants are perhaps better adapted to their environment.

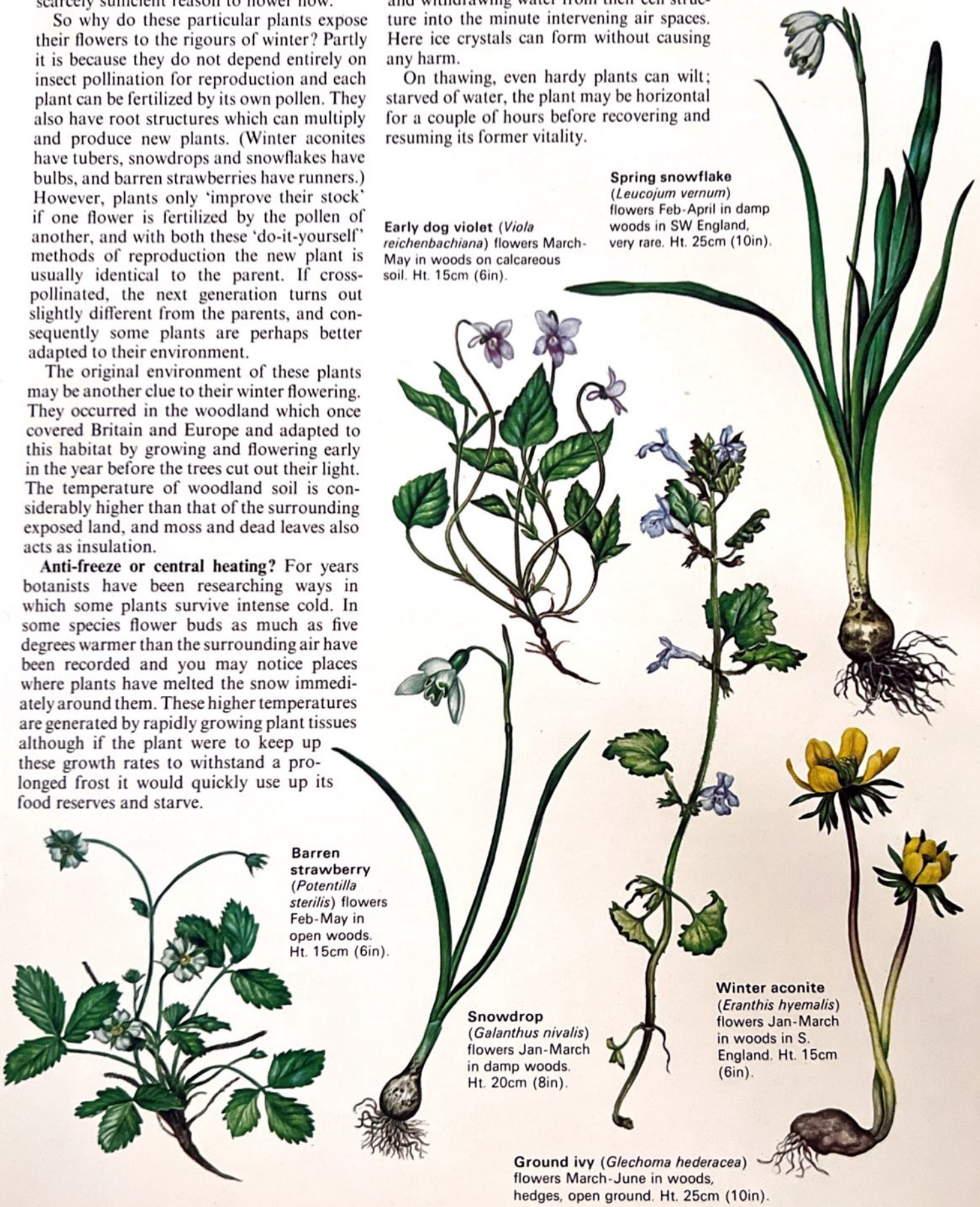
The original environment of these plants may be another clue to their winter flowering. They occurred in the woodland which once covered Britain and Europe and adapted to this habitat by growing and flowering early in the year before the trees cut out their light. The temperature of woodland soil is considerably higher than that of the surrounding exposed land, and moss and dead leaves also acts as insulation.

Anti-freeze or central heating? For years botanists have been researching ways in which some plants survive intense cold. In some species flower buds as much as five degrees warmer than the surrounding air have been recorded and you may notice places where plants have melted the snow immediately around them. These higher temperatures are generated by rapidly growing plant tissues although if the plant were to keep up these growth rates to withstand a prolonged frost it would quickly use up its food reserves and starve.

Some plants, such as garden dahlias, die immediately there is a frost while hardy plants such as snowdrops can freeze solid and then recover when they thaw. They do this by closing up to protect the reproductive parts and withdrawing water from their cell structure into the minute intervening air spaces. Here ice crystals can form without causing any harm.

On thawing, even hardy plants can wilt; starved of water, the plant may be horizontal for a couple of hours before recovering and resuming its former vitality.

Although not flowering as early as the winter flowers, the early dog violet (below left) and ground ivy (below centre) soon follow them in March.



Spring snowflake (*Leucojum vernum*) flowers Feb-April in damp woods in SW England, very rare. Ht. 25cm (10in).

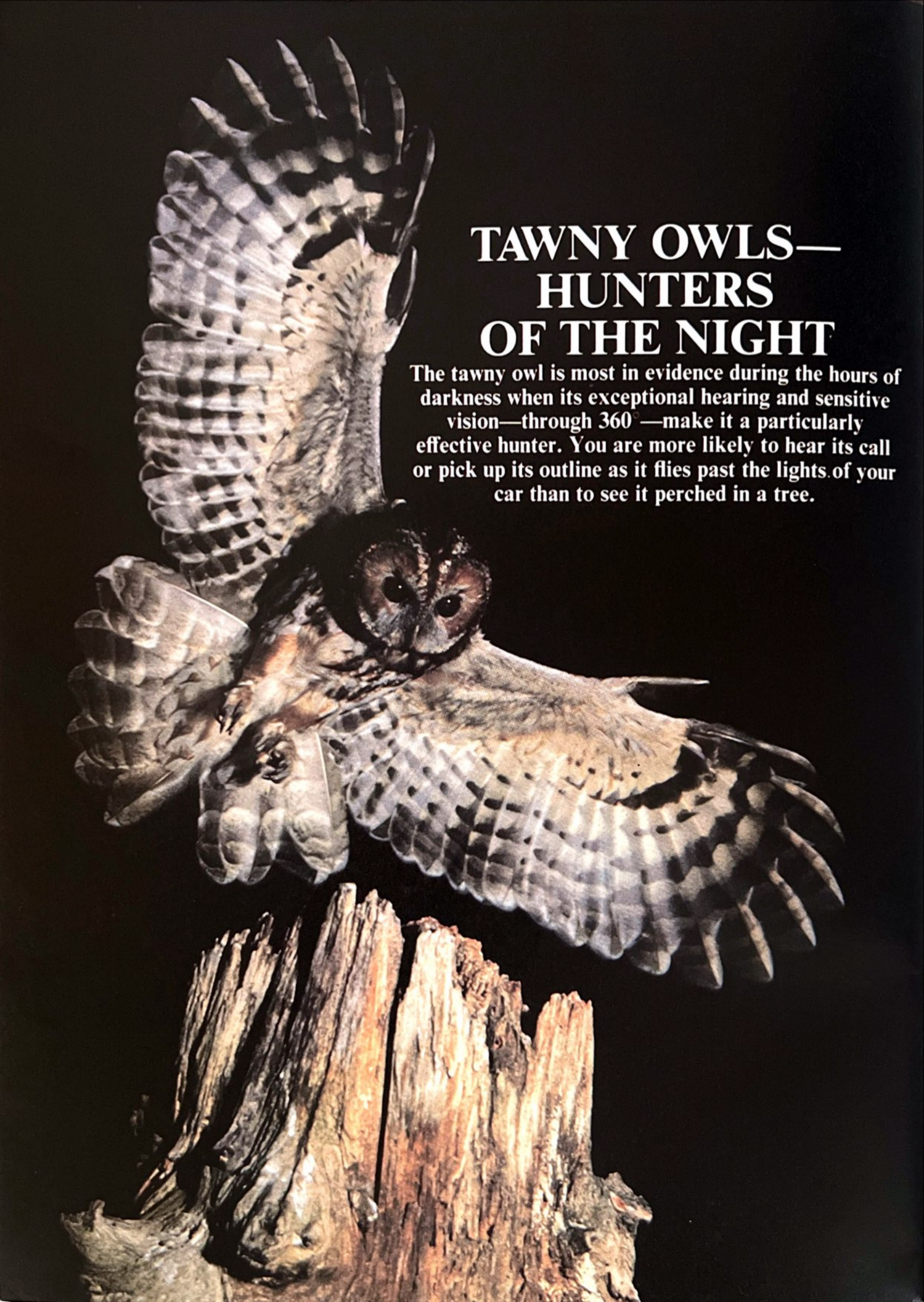
Early dog violet (*Viola reichenbachiana*) flowers March-May in woods on calcareous soil. Ht. 15cm (6in).

Barren strawberry (*Potentilla sterilis*) flowers Feb-May in open woods. Ht. 15cm (6in).

Snowdrop (*Galanthus nivalis*) flowers Jan-March in damp woods. Ht. 20cm (8in).

Winter aconite (*Eranthis hyemalis*) flowers Jan-March in woods in S. England. Ht. 15cm (6in).

Ground ivy (*Glechoma hederacea*) flowers March-June in woods, hedges, open ground. Ht. 25cm (10in).



TAWNY OWLS— HUNTERS OF THE NIGHT

The tawny owl is most in evidence during the hours of darkness when its exceptional hearing and sensitive vision—through 360°—make it a particularly effective hunter. You are more likely to hear its call or pick up its outline as it flies past the lights of your car than to see it perched in a tree.

Tawny owls are highly specialised nocturnal hunters. Although the head may seem disproportionately big, inside the skull are two large, asymmetrical ears so sensitive that they can pick up the rustling and high-pitched squeaks of nearby prey after dark. They can pinpoint a moving target like a mouse with such accuracy that a miss is rare. In addition owls have unusually large eyes. These are forward-facing—like human eyes and binoculars—for three dimensional vision, which enables owls to judge distance accurately. (Most birds have eyes on the sides of their heads.) The retina of each eye is extremely sensitive to light and so designed to enable the owl to see in very poor light.

The owl can turn its head both left and right (like a radar scanner) to inspect a full 360°, so the bird can search for and locate its prey while keeping its body still. The 'facial disc' of rather stiff, bristly feathers serves as a reflector, collecting sounds and focusing them on the ears.

Silent hunter The essence of effective nocturnal hunting is the silent approach—and again, in the tawny owl, evolution has come up with the necessary adaptations. The outer surfaces of the feathers have a velvety finish to deaden noise, and the feathers of the leading edge of the wing have a special comb-like fringe to silence the wing as it cuts the air.

Tawny owls will usually sit motionless on a branch, waiting for some unwitting meal to pass below. The owl then drops silently on to its victim, seizing it in the fierce grip of large, sharp talons. If this does not kill the prey instantly, the death blow may be administered by a sharp bite at the base of the skull.

In flight, tawny owls seem dumpy and top-heavy with broad, rounded wings and rather moth-like, fluttering wingbeats. They often appear misleadingly pale in car headlight beams but, when seen in daylight, the blacks, browns, buffs and chestnuts of their streaky plumage provide excellent camouflage against a tree trunk. This so-called 'cryptic' plumage has its values: if the tawny owl were not well concealed, its daytime resting period would be rudely shattered by tormenting groups of mobbing birds, trying to drive it away.

Food supply Although the tawny owl is primarily a rodent killer (voles, mice and rats are all acceptable), shrews and small birds have good reason to be concerned by its presence, as their remains regularly feature in pellets. Owls often swallow their prey whole and the regurgitated pellets are made up of the indigestible remains of its prey such as bones, fur and feathers. These left-overs can provide valuable clues to its diet. In the case of the tawny owl, rodents and birds occur prominently, but the wide variety of its diet (and thus the adaptability of the species) can be gauged by the regular presence of fish, amphibian and reptile remains. Nocturnal observations show that invertebrates, particularly worms which do not leave easily

Right: A dark triangle on the crown is a distinctive marking of the tawny owl.

Above: Primary and secondary feathers are soft to deaden the noise of the owl's descent—giving it the element of surprise and enabling its sensitive ears to do their job without disturbance.

Holes in trees provide a safe nest for the round white eggs which fit compactly in a small area.

Tawny owl (*Strix aluco*) Also called brown or wood owl; 38cm (15in) from beak to tip of tail; 40-45cm (16-18in) high; distribution widespread but absent from Ireland and some Scottish islands.

Below: The tawny owl uses its disproportionately large feet to good purpose when hunting. The formidable talons often penetrate a vital spot to administer an immediate death blow and, because they are widely spread and can grip effectively, they enable the owl to carry even small rabbits.

Top: Asymmetric ears enable the owl to locate its prey.
Above: Ear holes are so large that a human finger can fit inside.

Above: Wedged into the tree hollow so they can't fall out, these chicks rely on their parents for food. The larger one is about two days older than the other.

recognisable remains in the pellets, also feature largely when more substantial prey is in short supply.

Family planning In some uncanny way tawny owls seem able to assess the likely food supply at the start of the breeding season. In years when small mammals are low in number, clutches of eggs tend to be small; the number of eggs increases when mice, moles and small rabbits are more plentiful. Tawny owls usually have a single brood of young each year—and this occurs from mid-March onwards.

Unlike small birds, which wait until their clutch of eggs is complete, the female tawny owl starts incubating as soon as she has laid her first egg, which is like a ping-pong ball in size, shape and colour. The chicks hatch at about two-day intervals, each egg taking 28-30 days to hatch. The chick waits fretfully in the nest for food—usually mice, shrews and sometimes even small birds. The first born tends to get more than its fair share of the food, the result being a considerable difference in size between youngest and oldest. If food is plentiful, then all is well. Should food fail, then the biggest chick eats the smallest one. It may sound unduly brutal, but for the survival of the species it is better that two chicks die to provide food for a third, than for all three to die of starvation. In exceptionally hard years when the shortage of food is acute, the tawny owl may not breed at all.

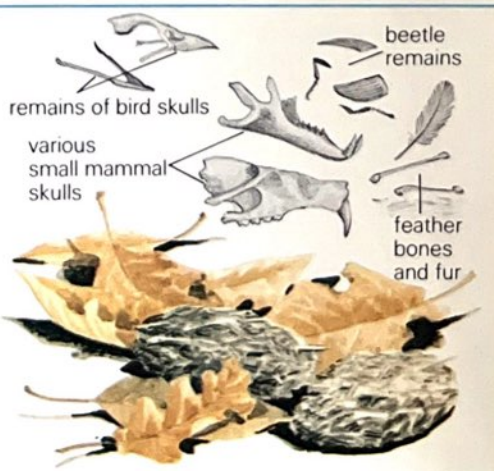
The owlets fledge (leave the nest) after five weeks, but for the next three months they continue to demand parental attention with hungry 'ku-wek' calls at their regular feeding stations, scattered through the woodland. After August, the parent owls begin to re-establish their territorial boundaries and the familiar calls, 'hoo-hoo-hoo' and 'tu-whit', are often heard. The youngsters finally move off or are driven away by the parent owls. This territorial activity increases in January and is probably at its height in February and March. Autumn and winter are the times when mortality is at its highest, particularly for the young birds, when cold weather and food shortages take their toll. Sadly, some also die in collisions with cars after dark on country roads, when the owls are dazzled by headlights.

Favourite nest sites are hollow trees, or cavities found in deserted buildings. One give-away sign of an owl's nest—or roosting site—is pellets around the base of the tree. Occasionally, eggs are laid in old nests of other birds such as magpies and carrion and hooded crows. If there is a scarcity of trees, tawny owls will even nest on the ground, perhaps choosing an old rabbit hole. Tawnies also take readily to nestboxes, and a barrel with good drainage holes, if slung at an angle beneath a high branch sheltered from direct wind and rain, will often tempt a pair of owls. The best time to go out and see tawny owls is on a clear night and at dawn, when they are returning to roost for the day.

The tawny is Britain's most numerous and widespread owl, though absent from Ireland; it's place there is filled by a different species, the long-eared owl (*Asio otus*). We think of it very much as a woodland bird, and to a degree this is true. However, there are plenty of mice, rats and house sparrows in towns, plenty of parks and large gardens with trees large and old enough to have holes for nesting—and of course there are plenty of suitable buildings like churches in which to nest. Add to this the very catholic diet of tawny owls, and it becomes less surprising that these adaptable birds have taken to urban and suburban life so well.

Owl pellets

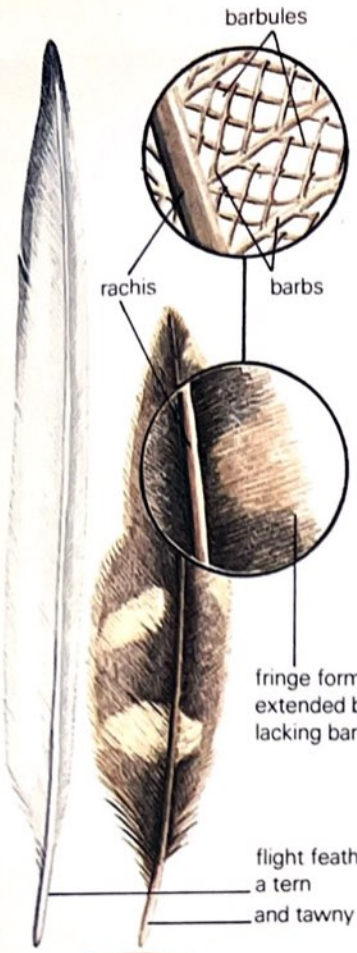
Pellets are found under a roost or nest site, usually at the base of a large tree. They contain the indigestible parts of a meal—mostly fur and bones—which have been compacted in the gizzard before being coughed up. The average length is 42mm (1¾in). The average width is 19mm (¾in).

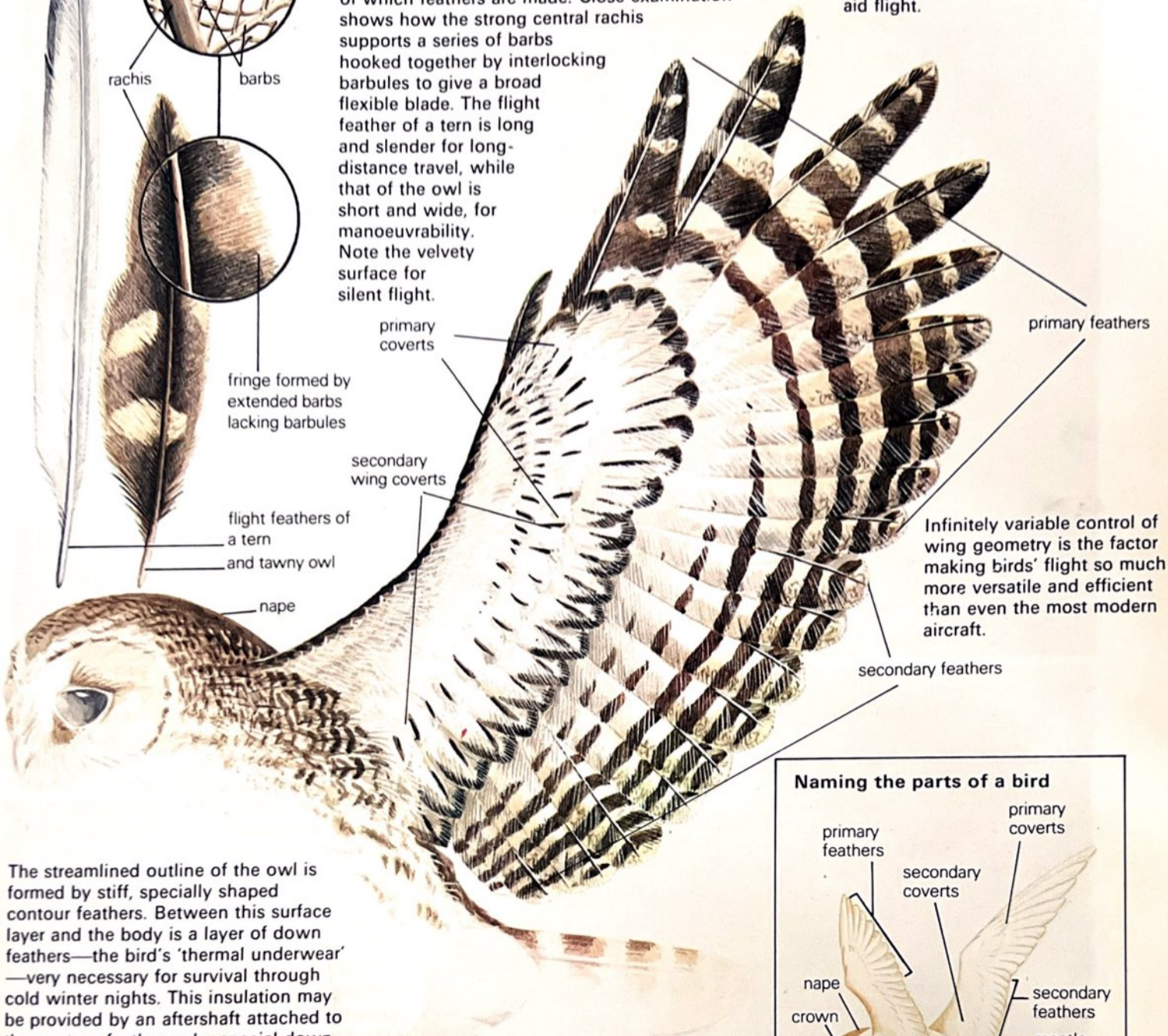


Birds and their feathers

Flight feathers must be strong, yet flexible and ultra-light. Lightness comes from the keratin of which feathers are made. Close examination shows how the strong central rachis supports a series of barbs hooked together by interlocking barbules to give a broad flexible blade. The flight feather of a tern is long and slender for long-distance travel, while that of the owl is short and wide, for manoeuvrability. Note the velvety surface for silent flight.

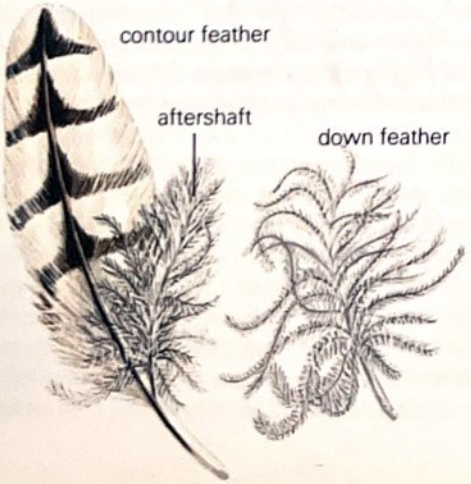
Large birds have conspicuously 'fingered' wing-tips. The feathers are cut away to produce slots (as in modern aircraft) to improve air flow and therefore aid flight.





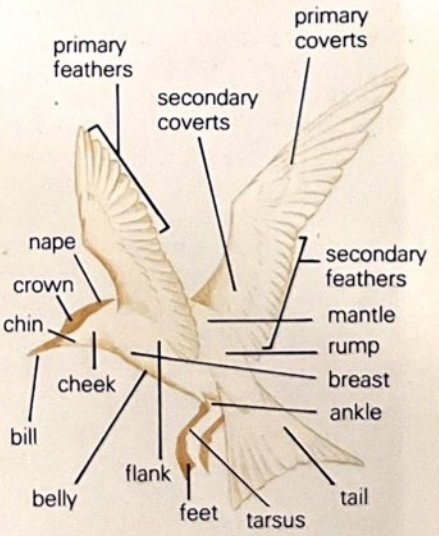
Infinitely variable control of wing geometry is the factor making birds' flight so much more versatile and efficient than even the most modern aircraft.

The streamlined outline of the owl is formed by stiff, specially shaped contour feathers. Between this surface layer and the body is a layer of down feathers—the bird's 'thermal underwear'—very necessary for survival through cold winter nights. This insulation may be provided by an aftershaft attached to the contour feather or by special down feathers.



Feathers are vital to a bird's survival. They power flight and supply warmth, and the colours and patterns used in courtship, aggression or camouflage are all in the feathers. Thus their maintenance is of utmost importance. Disarranged barbs must quickly be put straight to maintain flight efficiency, and this is the purpose of preening, which seems to occupy so much of a bird's time. Preen oil is applied by wiping the beak across a gland above the tail and then passing each feather through the beak, when rapid nibblings re-adjust any displaced barbules.

Naming the parts of a bird



Whether you want to describe a bulky bird like an owl or a slim tern, the same words apply to both. The parts vary in colour and shape, providing a means of identifying each species. To help identify an unfamiliar species, it is worth keeping a note book and making a rough sketch, labelling the colour of each part.

Above: Most of the year Exmoors run free in herds. In October they are rounded up, driven down to the farms, inspected and branded.

EXMOOR PONIES
the survivors

Of the nine native types of pony in Britain the Exmoor is one of the toughest. Exposed to the worst winter weather, this breed copes as well as the wild red deer on this West Country moorland.

EXMOOR PONY
Distribution the high open moors of Exmoor and part of Cumbria
Size of adult male 12¾ hands (130cm) at withers (top of the shoulders); 350-400kg (55-63st)
Size of adult female 12½ hands (127cm) at withers; 350-400kg (55-63st)
Colour brown coat, black mane and tail, oatmeal-coloured muzzle
Breeding season foals born April or May
Gestation period 50 weeks
Number of young one; twins unknown
Life-span 25-30 years
Food grass and other moorland plants
Predators none

hoof print

The track of an unshod pony is almost circular

cleft

Because its ancestors evolved in an ice age (more than a million years ago), the Exmoor pony survives the cold and wet because of its behaviour and physical structure. Its coat can vary in colour between dark brown and bay and it has a surface of long, oily guard-hairs that mat together when they get wet and make little triangles, so that the rain drips easily away from the tips. Below the guard-hairs, the thick undercoat stays dry and is such good insulation that in a snow storm the pony's back can be covered in snow without its body heat melting the snow.

In a winter storm Exmoors stand, like all ponies, head down with tail towards the wind. The sensitive parts of the head are sheltered by the body, while the neck is protected by a thick, waterproof mane and the thick tail protects the rear.

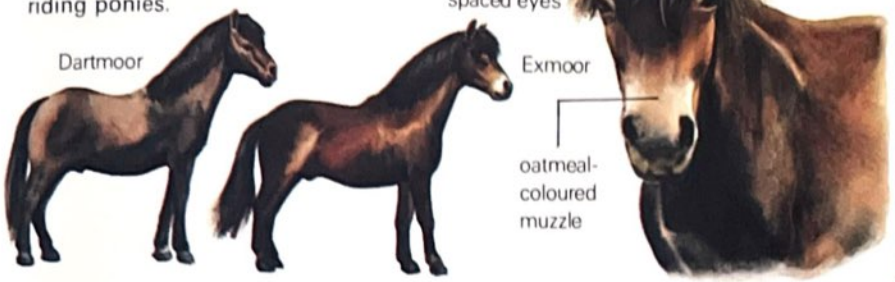
Pure-bred ponies are so hardy that they can survive a bad winter as well as the wild red deer of Exmoor. The ponies are never brought in for shelter and can find all their own food—unlike cross-bred ponies which cannot survive the whole year on the moorland.

Wild or domestic? Free-living Exmoor ponies are almost wild animals—'almost' because, unlike real wild creatures, each pony belongs to someone and is branded on its flank. The branding is done in the October following the pony's birth. Every October all the ponies are rounded up to bordering farms with enclosed fields where the youngsters are examined and surplus animals sold, often for training as riding ponies. The breeding herds are soon returned to the high moor where they spend the rest of the year. Exmoor ponies are wild, however, in the sense that they have to find their own food, care for their young and are free to wander over huge areas of the moor.

The Exmoor Pony Society records show that only about 100 ponies still live the wild life on Exmoor itself. Each herd consists of as few as four or as many as 20 mares led by a single adult stallion. There will also be foals

How Dartmoors compare with Exmoors

Dartmoor ponies are descended from Exmoors but have been extensively crossbred and so vary in colour more than their ancestors. Their chests are less deep and they have shorter, smaller heads with less prominent eyes. Like Exmoors they make excellent riding ponies.



and young ponies of both sexes in the herd.

On Exmoor itself you have a good chance of seeing free-ranging herds if you leave the road on Withypool Common or on Winsford Hill and walk a mile or so on to the moor. There is also a small herd of Exmoors which has been introduced by man into the Cumbrian hills. The other Exmoor ponies you can see in many parts of Britain are domesticated and kept as riding ponies. They are especially good for pony-trekking and, in days gone by, were used for shepherding and to pull pony traps and were crossed with Shetlands for use as pit-ponies.

All types of pony and horse can interbreed and for hundreds of years man has always crossed breeds from different areas to create special types and sizes of horse. Because Exmoor ponies are small they have often been cross-bred with larger animals in the hope of combining the hardy character of the Exmoor with the larger size of the horse. These cross-breeds make good riding ponies but they are never as tough or have quite the same appearance as real Exmoors. The pure Exmoor is one of the least variable of horses—it always has the same colouring.

Life in herds A scientific study of Exmoor pony herds was made by Dr. Susan Gates, who spent three years watching them. The herds she studied each stayed within an area of about 800 acres even though they were free to move over much larger areas. Neighbouring herds often ranged across overlapping areas and sometimes met. Occasionally, females would change herds; but usually the herds kept apart and the members of the herd stayed loyal to their group. When the stallion of one herd was removed for a few days the mares all stayed together and avoided other herds in the area.

In April and May the herds keep well apart from each other. This is when the foals are born and start to suckle milk from their mothers. Only nine days after giving birth, the mares are ready to mate again with the stallion. The early season of birth means the foals have the whole summer to grow and get fit for the crucial survival test—their first winter.

Exmoor's evolution Fossil bones of ponies have been found dating back 100,000 years to the tundra-like conditions (i.e. frozen wastelands) of the Ice Age. The bones and long faces of the fossil ponies are remarkably similar to those of a modern Exmoor pony. These ponies may well have been domesticated by the pre-Celtic people who moved up into Britain as the ice flow receded northwards. On Exmoor the original wild ponies survived much longer and became the half-wild/half-domestic creatures they are today. This means that Exmoor ponies may well have lived in Britain long before many of the truly wild mammals of today's countryside, and indeed before man.

Above: Foals are often bought to be tamed for pony trapping at country shows and for riding. A sturdy Exmoor can carry 75kg (12st) all day.

Below: This four-month-old foal is already growing its darker winter coat. Unlike the adult it has a short, bristly mane.

THE HEDGEROW— A WINTER REFUGE

Although the land looks bleak and empty in winter, there is constant activity in the thorny hedgerow thickets. Stoats and foxes use the sheltered passageways to stalk prey; ladybirds and earwigs crawl into hollow stems for warmth and protection; and birds fly from as far as Scandinavia to feed on the berries.

The hedgerow is a particularly rich habitat because it has characteristics belonging to two other habitats—woodland and open field—attracting animals and plants from each, as well as containing its own particular species. It offers a haven to all sorts of wildlife, especially in winter when the surrounding landscape is bare and exposed.

Hedge structure At the heart of an old hedgerow lies a dense shrub layer, often a mixture of hawthorn, blackthorn, elder and dogwood. At intervals along this strip, trees such as elms, oaks and ash create a broken canopy (before the days of Dutch Elm disease about half of England's hardwood timber grew in hedgerows). These trees act as host to all kinds of woodland creatures.

At ground level, a herbaceous border hugs the hedgebank along the edge of fields. This is made up of a mixture of well-known countryside plants such as nettles, jack-by-the-hedge and lords-and-ladies. These three layers—tree, shrub and field edge—are not distinct, however, for swags of honeysuckle, wild hops, clematis, bryony, bramble and dog rose climb riotously between them, knotting the whole together.

Winter shelter Hedgerows, especially of hawthorn with its tangle of spiny twigs, were planted primarily to contain livestock, and incidentally to offer them some shelter from bad weather. In this second role, wildlife also benefits, particularly in winter. Many birds roost in hedges overnight and a small hawthorn thicket may accommodate several hundred starlings and lesser numbers of fieldfares, wood pigeons, stock doves and magpies. A dense hedge offers them protection from ground predators and also from wind which causes greatest loss of heat (and energy) during long winter nights. With the onset of winter, many insects also seek nooks and crannies in the interior of the hedge to hibernate.

Hedgerow highways Hedges act as convenient corridors, making it easy for both plants and animals to spread in safety from one habitat to another. This can be essential for the survival of a species. If, for example, a particular insect is confined to one isolated woodland, and that wood is destroyed by fire, the species would become extinct. If the wood is linked by a hedgerow to another copse then the insect may have already colonised the hedge so the species has a chance of survival.

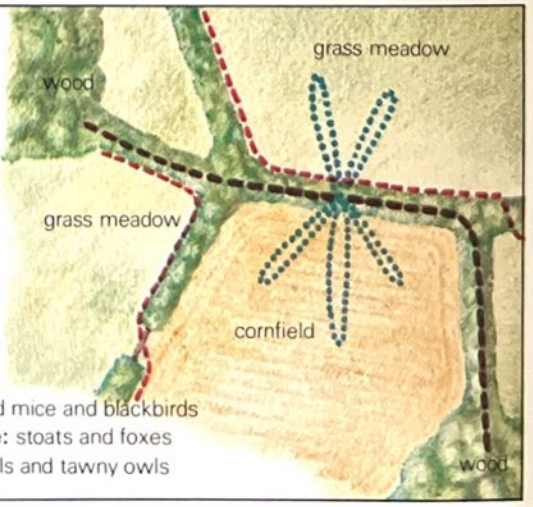
As hedges often radiate out from woodland edges, they also create a strip-like continuation of the woodland food supply. Squirrels, for example, shunning the exposed fields, make sorties along hedges to forage for hazel nuts. Badgers will come out of a wood to root along hedgebanks for whatever they can find.

Plants which cannot spread across open fields often 'travel' along the base of a well-grown hedgerow. Shade-loving woodland plants such as bluebells and primroses take advantage of the damp and overhanging conditions similar to that of the wood. The seeds of fruit-bearing plants are dispersed along the hedgebank by birds and small mammals, often far away from the parent plant. Most berries are eaten for their fleshy outer coat. The hard seed passes through the animal undamaged, so a solitary blackberry bush can be the source of several other clumps of bushes along a hedge over a period of time.

Larder for animals The special plant community that makes up a mature hedgerow offers a wider range of foodstuffs than most deciduous woodlands, making the hedge a very attractive habitat in winter, particularly for birds. Migratory fieldfares and redwings

Hedgerow highways

Animals that live in and close to hedges use them as highways where they can travel in relative safety. Residents such as stoats and foxes use them as cover for stalking; rabbits and wood mice make short trips into fields to feed; woodland animals can move from one copse to another via the hedges.



residents: rabbits, wood mice and blackbirds
hunters in lee of hedge: stoats and foxes
wood dwellers: squirrels and tawny owls

join blackbirds, thrushes and starlings from home and abroad, and flocks of finches, buntings, sparrows and tits to exploit the seasonal succession of berries and seeds. After glutting on the autumn harvest of elder and blackberries, birds turn to rose-hips and haws, then sloes, and finally to ivy berries. Hips and sloes are taken mostly by thrushes, while agile tits collect the fruits of spindle, honeysuckle and bryony.

In winter, voles, mice and squirrels bury caches of seeds and nuts. Wood mice and bank voles are good climbers and so can get at the berries high up in the hedge. A typical winter menu would include rose-hips, haws, hazel nuts and acorns. With practice, we can learn from seed remains who has been eating them. Wild mice eat only the hard centre of haws, discarding the fleshy coat, while bank voles do just the opposite.

Change of diet This bounty of vegetarian foods allows quite a number of mammals to remain active throughout the winter. But the predators such as weasels and stoats have to be versatile to survive. In winters when the hedgerow fruit crop is poor (hawthorn is very variable), and the rodent populations correspondingly low, predators alter their diet to include roosting birds or even move into nearby woodlands and fields in search of other food.

A few invertebrates also manage to stay

Above: Planted originally to mark boundaries and enclose patches of land, Britain's 600,000 miles of hedgerow provide a vital habitat for wildlife.

How to date a hedgerow
You can estimate the age of a hedge by counting the number of shrub species in a 30m (100ft) stretch. On average it takes 100 years for a new species to become established, so a hedge with four shrub species is likely to be roughly 400 years old.

Above: Like the more common wood mice, the yellow-necked mice are expert climbers, often using old birds' nests high up in hedges as feeding platforms where they have stored nuts and berries.

Right: The brimstone is the only hibernating butterfly you are likely to find in hedge tops. The brightly coloured male is the first to leave the clumps of ivy or holly which have protected it through the winter.

Left: The eating habits of the rabbit have strongly influenced the composition of hedges: hawthorn, elder and nettles, which rabbits find unpalatable, thrive whereas spindle bushes, which they devour, are rare.

Below: Hedges are an important port of call for fieldfares and other migratory birds which arrive from the Arctic, usually in October, to feed on the berries.

active throughout the winter, notably slugs, which tunnel deep into the hedgebank soil if freezing weather sets in. Snails are less adventurous, sealing off the entrance to their shell with a mucus plug and staying put for the duration of the winter, often in company with others. Hawthorn is a particularly good place for finding active invertebrates in winter because it favours growth of lichens and the slimy alga called *Pleurococcus*, both of which provide food for springtails, barklice and woodlice. A select band of moths—winter moths, spring ushers, pale brindled beauties and mottled umbers—are also active in winter, laying their eggs at this time. The most striking feature of the group is that the females are small, wingless, bug-like creatures, scarcely recognisable as moths at all. The ones we see flying around the hedgerow are the amorous males, seeking females on the trunks of trees.

Dormant insects The vast majority of insects overwinter as eggs, larvae, pupae or hibernating adults. A careful examination of any part of the hedge will yield insects: ladybirds dormant in thick beds of lichen and crevices in and under bark; earwigs huddled together in the hollow, dead stems of hogweed; the larvae of holly leaf-miner flies inside the blisters on holly leaves.

All of these dormant insects are, of course, vulnerable and supplement the vegetarian diet of roving mammals. Shrews take their toll of buried pupae; wrens, custom-built for the labyrinthine hedge habitat, mop up spiders' eggs; tits puncture the blisters on holly leaves—just as they peck through milk bottle tops—to extract the larvae of the leaf-miner fly.

Wind-breaks As well as providing shelter for over-wintering creatures, the hedge can also act as a wind-break for nearby ploughed fields. Where hedges have been removed on a large scale, as in East Anglia, the wind can blow in any direction over wide areas. In dry winter weather this poses a serious problem for the farmer because the fields get very dry. The crops have not yet grown much so their roots do not bind the soil, nor do their leaves protect it. The wind whips up the surface layers, together with seeds and costly fertilizer, which then disappear over the horizon in a cloud of dust. A long line of hedges greatly reduces the destructive effects of the wind.

Given its sheltered conditions and the fact that it is a great reservoir of wildlife, the hedgerow is one of the best places to look for early signs of spring. From January onwards, the territorial song of the great tit is increasingly heard, soon accompanied by the more lyrical mistle thrush. In February, elder leaves begin to unfold and a sunny day may coax out an early brimstone butterfly. Blackbirds have been known to start nesting in February and some rabbits may be giving birth to their first new generation of the year.

Avon

Dark alders frame a lazy river. Insects drone among tall stems of yellow rocket. Fields rise in folds to a distant, tree-topped hill. It's high summer on the River Avon near the village of Saltford.

The far bank has been cleared of alders at some stage—perhaps to let cattle reach the water. The hayfield behind has been cut and beyond its hawthorn hedge, winter wheat is already green. A field in the middle distance is newly-ploughed, pale from the limestone nature of its soil.

There are many such vistas in the county which takes its name from the river. It stretches from the Severn estuary eastwards to the Cotswolds and the Wiltshire border, and from the Mendip Hills north to the Vale of Berkeley. Bath and Bristol are two bases for those requiring urban comforts at the day's end. Weston-Super-Mare is a third, its flat, wide sands overlooking the herring-gull sanctuary of Steep Holme Island.

Within the rough triangle of these three places lies an unspoilt countryside laced with quiet lanes and footpaths and watered by streams and rivers like the Yeo, the Chew, the Kenn and the Banwell. The rivers in turn feed the beautiful lake reservoirs of Chew Valley, Blagdon and Barrow Gurney, all good spots for bird-watching.

There are some memorable walks, notably from Clevedon, where two ranges of hills converge. One runs inland towards Bristol, ending at Leigh Woods, with magnificent views of the Avon gorge; another goes north to the cliffs by Portishead. Cadbury Camp, an Iron Age fortification, stands on a hilltop a few miles east of Clevedon; and a track from the village of Churchill, on the Bristol road east of Weston-Super-Mare, leads up to the imposing Iron Age earthworks of Dolebury Camp. Pre-Roman Britons may have made the steep steps leading into Kewstoke at the end of a fine walk up a coastal lane from Weston.

The county stands mostly on soft sandstone, limestone and clayey mixtures, with harder limestone ridges—visible where the Avon has carved its gorge. There's coal in places too, beneath the surface: fine fossilized plants have been found in the pit heads at Radstock. Many varieties of wild flowers and plants flourish in the limestone soil: red valerian along the Gorge; the woolly-headed thistle with its reddish-purple flowers growing up to 150cm (5ft) around Bath and Bristol; and many limestone-loving trees and climbers.

Nature trails: **Ashton Court**, just off A369 Bristol/Portishead road. Two ($2\frac{1}{4}$ and $1\frac{1}{2}$ miles) through wood and parkland. **Avon Gorge**, Leigh Woods north entrance on A369 Bristol/Portishead road. Five FC trails ($\frac{1}{2}$–$1\frac{1}{4}$ miles) through mixed conifer and broadleaf. **Frome Valley**, (2 miles) along river Frome from Stapleton to Frenchay. **Kennet and Avon Canal**, (2 miles) from Widcombe to Bathampton. **Poet's Walk**, Clevedon (1 mile) from Marine Lake around Church Hill and Wains Hill.
Further details from Tourist Information Centre, Colston House, Colston St, Bristol
Tel. 293891

Avon Gorge National Nature Reserve (NT), managed by NCC. Entrance at Valley Road, Leigh Woods. An important broadleaved wood on carboniferous limestone, rich in fungi.

Parklands: **Dyrham Park** (NT), 263 acres, with one of the country's oldest herds of fallow deer. Open daily 12–6. **Dodington**, 700 acres, Easter—end Sep. **Ashton Court Estate**, 825 acres with deer park. Open daily.

FC=Forestry Commission, NT=National Trust, NCC=Nature Conservancy Council.

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